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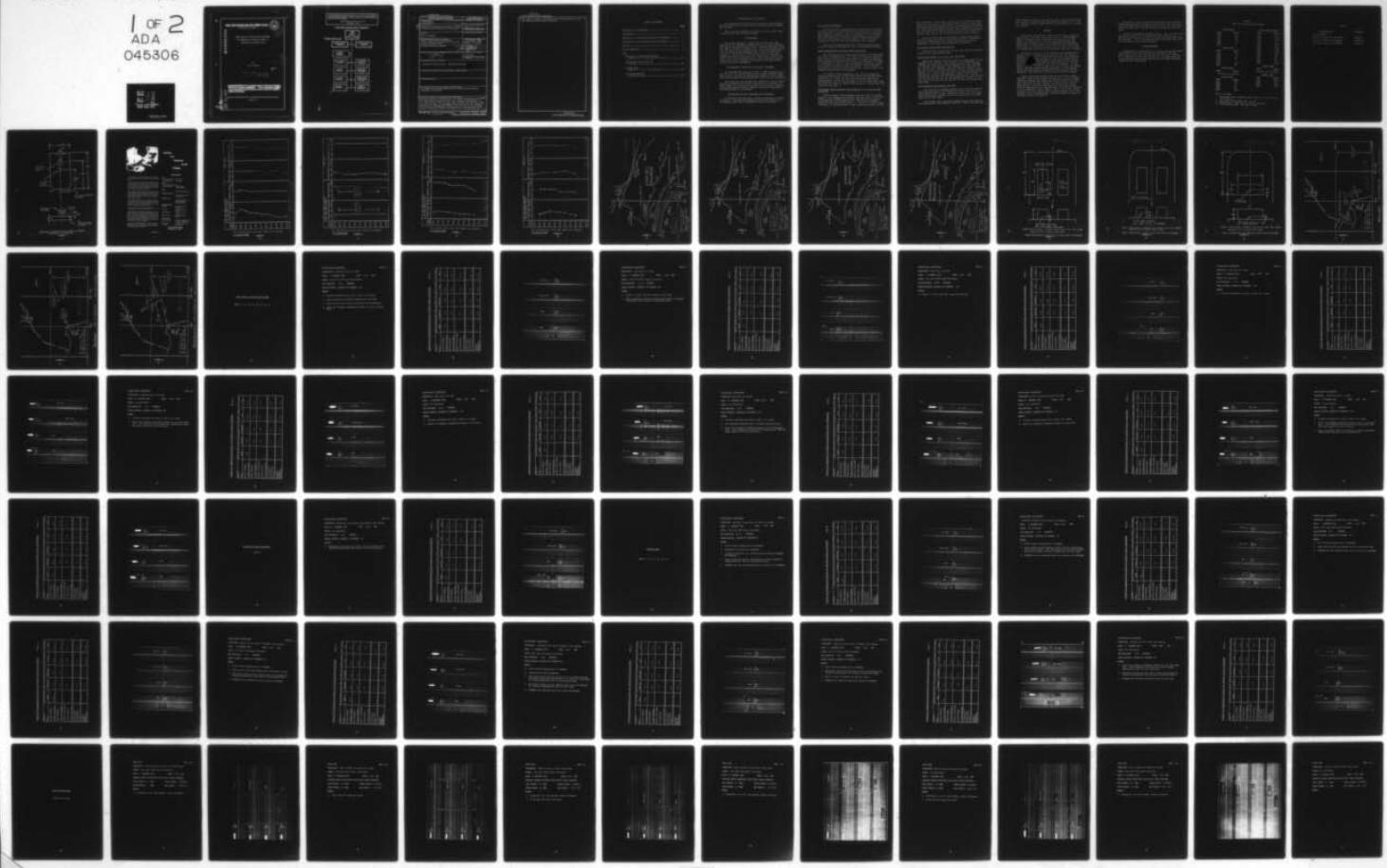
DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/G 13/10  
COMPILATION OF MOTION DATA OBTAINED ON VOYAGEUR ACV DURING OSDO--ETC(U)  
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# NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER

Bethesda, Maryland 20034



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## COMPILATION OF MOTION DATA OBTAINED ON VOYAGEUR ACV DURING OSDOC II EXERCISE IN OCTOBER 1972

by

R.D. Pierce

OCT 18 1977

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Central Instrumentation Department Evaluation Report

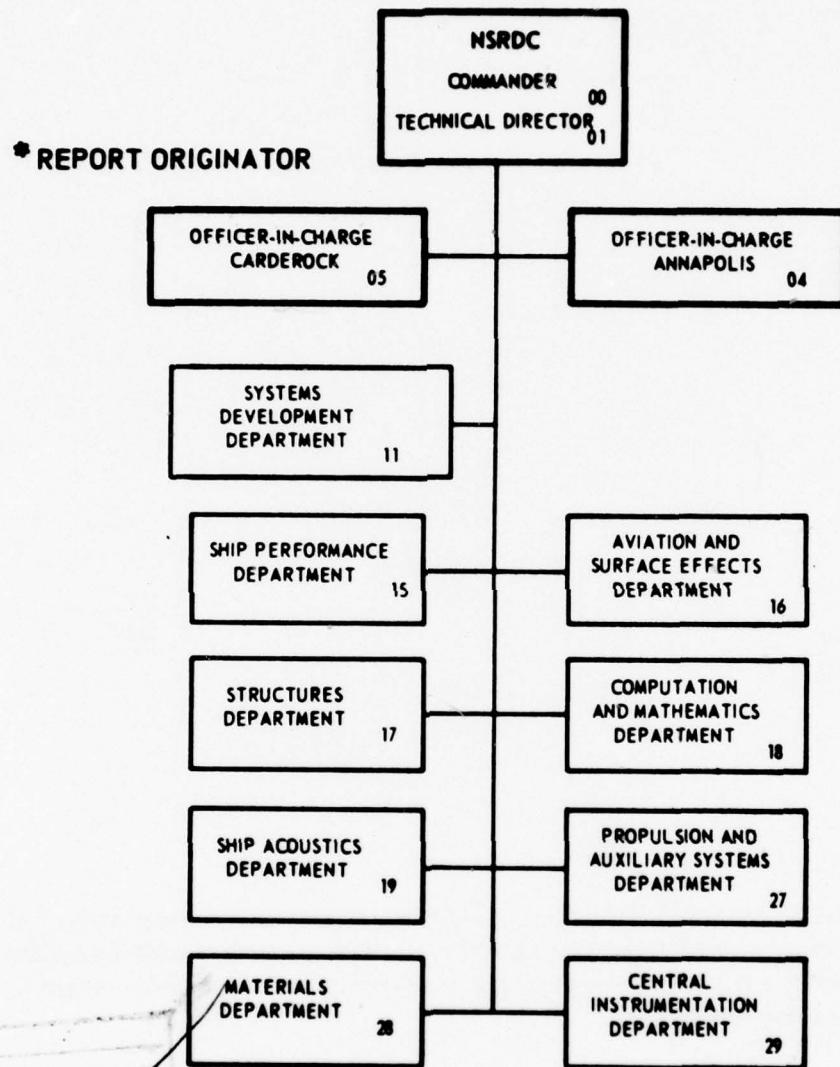
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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>This report presents a compilation of full scale data obtained on the VOYAGEUR Prototype S/N 001 Air Cushion Vehicle, ACV, during its participation in U.S. Army Exercise OSDOC II at Fort Story, Virginia in October 1972. Data was obtained during: (1) high speed, fixed condition runs, (2) mooring operations with the container ship "WARRIOR" and an LST, and (3) surf crossings. The motions of the VOYAGEUR ACV were measured in various sea states in the range of a high State 1 Sea to a low State 3 Sea. The conclusions made in |                       |  |

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→ this report are limited to the factors that affected the quality of the data during acquisition and/or processing.

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## ADMINISTRATIVE INFORMATION

The acquisition of this data was funded by the Amphibious Assault Landing Craft Program Office under Initiator's Request No. 1182/002.

The use of the VOYAGEUR was funded by the U.S. Army under a contract with Bell Aerospace Canada.

## INTRODUCTION

This report presents a compilation of full scale data obtained on the VOYAGEUR Prototype S/N 001 Air Cushion Vehicle, ACV, during its participation in U.S. Army Exercise OSDOC II at Fort Story, Virginia in October 1972. Data was obtained during: (1) high speed, fixed condition runs, (2) mooring operations with the container ship "WARRIOR" and an LST, and (3) surf crossings. The motions of the VOYAGEUR ACV were measured in various sea states in the range of a high State 1 Sea to a low State 3 Sea. The conclusions made in this report are limited to the factors that affected the quality of the data during acquisition and/or processing.

## DESCRIPTION OF CRAFT AND MEASUREMENT EQUIPMENT

The VOYAGEUR ACV prototype S/N 001 is approximately 32.7 ft. wide and 59.2 ft. long with an unloaded weight of about 34,000 lbs. Figure 1 details the approximate dimensions of the craft, the craft's center of gravity and the location of the transducers.

The NSRDC Type 617 Portable Data Acquisition System (PODAS) was used to measure and record on magnetic tape the roll and pitch angles, as well as accelerations at the control cabin and at the port edge of the bow. Figure 2 provides a description and specifications of the PODAS.

## DESCRIPTION OF TEST CONDITIONS AND PROCEDURES

A listing of the data runs in order of occurrence is given in Table 1. This cross reference will facilitate the use of the figures which will be referenced later in this text.

### Sea and Surf Conditions

The sea and surf conditions that existed during those days that data runs were made can be found in Figures 3, 4, 5 and 6. The combined sea and swell data was measured near the container ship "WARRIOR", located at point A on Figures 7, 8, 9 and 10. These same figures also show the estimated directions at point A of the sea and swell on a daily basis. Point D on these figures was where the surf zone conditions were measured.

This data was obtained from the Field Data Summary which is part of OSDOC II Subobjective 10.1: Environmental Factors.

### Cargo Configuration and Craft Center of Gravity

Four different cargo configurations existed during the data runs with the VOYAGEUR ACV. The cargo configuration changed as the number of containers and the weight per container changed. Table 2 presents the four conditions as a function of the number of containers and the weight per container. Figures 11, 12 and 13, referenced in Table 2, show how the containers were located on the craft for each particular condition. The cover sheet for each run, presented in the data section of this report, will reference these cargo configurations.

The craft's center of gravity, C.G., for any particular cargo configuration was modified by transferring ballast either forward or aft so that the C.G. would always be basically at the same point. Thus, for all runs and for any given cargo configuration, the C.G. was estimated to be 374 inches  $\pm$  48 inches aft of the bow along the center line and about 2 inches below the surface of the deck.

### High Speed, Fixed Condition Runs (Runs 1, 2, 3, 9, 10, 14, 15, 16 and 17)

The high speed, fixed condition runs were made in an open seaway at an estimated fixed heading into the waves, so that the motions of the VOYAGEUR ACV could be recorded as this heading was changed for each succeeding run. The desired headings, listed in order of priority, were: 1. Head seas - craft heading into waves, 2. Following seas - craft and waves traveling in the

same direction, 3. Beam seas - craft and waves traveling perpendicular to each other, 4. Quartering seas - craft and wave directions form a 45 or 135 degree angle. The estimated courses that the craft took during these runs are shown in Figures 14, 15 and 16. Each figure references a group of runs made at approximately the same time of day. The estimated directions of the sea and swell at this time of day is also presented on these figures.

The use of the craft was obligated to OSDOC operations, so these runs were made when a time opening occurred. Similarly, the cargo configuration that existed during these runs was dependent on the existing configuration at this time.

#### Zero Speed, Open Seaway Run (Run 19)

One zero speed, open seaway run was made with the craft off cushion in an estimated beam sea.

#### Mooring Runs (Runs 4, 5, 6, 11, 12, 13 and 18)

During the mooring runs, the craft was moored either to the "WARRIOR" or to the LST. While mooring to the "WARRIOR", the VOYAGEUR was positioned on the starboard side of the "WARRIOR" at a distance from the bow of the "WARRIOR" of about one third the length of the "WARRIOR", with the "WARRIOR" located at 75 deg. 58 min. 29.1 sec. west and 36 deg. 55 min. 19.8 sec. north. Figures 7, 8, 9 and 10 show the ship's estimated heading for the time and day listed on any particular figure. This heading information was taken from the Field Data Summary. For the mooring run with the LST, Run 18, the VOYAGEUR was located at the port side of the stern of the LST, and the LST was heading north north east.

#### Surf Crossing Runs (Runs S-1 to S-20)

The pilot of the VOYAGEUR normally took the craft from the beach into the surf at an estimated 45 degree angle and at a speed between 10 to 15 mph. The surf to shore runs were generally made straight through the surf at approximately the same speed as the surf waves.

During these runs, the craft crossed the surf and went up onto the beach at two different locations. These locations were

at the beach near the crane, point B, and at the beach near home base, point C. Points B and C are shown on Figures 7, 8, 9 and 10. The beach slope at both points was estimated to be 4 inches in 12 feet.

## RESULTS

Strip chart records were made of all the data, except for Runs 7 and 8. For Runs 1 to 6 and 9 to 19, a representative portion of each run was photographed and presented in this report. For Runs S-1 to S-20, the surf crossing runs, the entire surf crossing record was photographed and included in this report. In Runs 1 to 6 and 9 to 19 the time base of the strip charts is 5 seconds for each major division, and in Runs S-1 to S-20 the time base is one second for each major division.

For Runs 1 to 6 and 9 to 19, the data was converted into digital form and analyzed on the Center's CDC 6700 digital computer. The analysis program PSHAFT and GPP computed histograms and power spectra of the roll and pitch angles, and of the cabin bow accelerations. Cross-spectral analysis was performed between pitch angle and cabin acceleration so that heave could be calculated at the C.G., if necessary. In this report, only the values for the significant motion (the average of the one-third highest double amplitudes) and the extreme double amplitude motion experienced for each measurement are presented. The other data can be made available on request.

These significant motion values and the extreme double amplitude values are presented for each run in a table titled: "Summary of Significant Motions and Extreme Double Amplitudes." This table presents the significant values computed from the power spectrum, the time history, and the double amplitude distribution. An Interpreted Value for Significant Motion which is considered to be representative of the process measured is also presented in these tables. When a known irregularity occurred in the data which affected these computed values, this affected value was disregarded. Such occurrences are noted in the Notes Section for each run.

For Runs S-1 to S-20, the surf crossing runs, the extreme double amplitude that occurred in the surf zone was taken from the strip chart record and presented along with the strip chart record for each run. No other analysis was performed on this data.

No data is presented for Runs 7 and 8. Run 7 was too short for proper analysis and the conditions under which it was obtained were basically identical to other run conditions which were analysed. Runs 8 was obtained under conditions which were too nonstationary for proper analysis.

#### ACKNOWLEDGEMENTS

Appreciation is expressed to C. Stevens who operated PODAS during most of the data runs and who coordinated the data acquisition, to D. Jones who provided the Field Data Summary, to S. Gunderson who provided detailed sea and swell data, and to the Bell Aerospace Canada employees who provided assistance during the data acquisition.

TABLE 1  
DATA RUNS IN ORDER OF OCCURRENCE

| <u>8 Oct. 1972</u>     |              | <u>11 Oct. 1972 (cont.)</u> |              |
|------------------------|--------------|-----------------------------|--------------|
| <u>Time</u>            | <u>Run #</u> | <u>Time</u>                 | <u>Run #</u> |
| 1050                   | S-1          | 1011                        | 11           |
| 1100                   | S-2          | 1028                        | S-11         |
| 1247                   | S-3          | 1047                        | S-12         |
| 1253                   | 1            | 1054                        | 12           |
| 1306                   | 2            | 1157                        | S-13         |
| 1324                   | 3            | 1201                        | 13           |
| <u>9 Oct. 1972</u>     |              | <u>12 Oct. 1972</u>         |              |
| <u>Time</u>            | <u>Run #</u> | <u>Time</u>                 | <u>Run #</u> |
| 1145                   | S-4          | 1437                        | S-16         |
| 1204                   | 4            | 1455                        | S-17         |
| 1518                   | S-5          | 1456                        | 14           |
| 1529                   | 5            | 1507                        | 15           |
| 1540                   | 6            | 1517                        | 16           |
| 1601                   | S-6          | 1526                        | 17           |
| 1610                   | S-7          | 1537                        | S-18         |
| <u>10 Oct. 1972</u>    |              | <u>Time</u>                 |              |
| <u>Time</u>            | <u>Run #</u> | (No Runs for this day)      |              |
| (No Runs for this day) |              | <u>13 Oct. 1972</u>         |              |
| <u>11 Oct. 1972</u>    |              | <u>Time</u>                 | <u>Run #</u> |
| <u>Time</u>            | <u>Run #</u> |                             |              |
| 0936                   | S-8          | 0748                        | S-19         |
| 0938                   | 9            | 0800                        | 18           |
| 0949                   | 10           | 0934                        | S-20         |
| 0956                   | S-9          | 0939                        | 19           |
| 1005                   | S-10         |                             |              |

**Key to run type:**

1. High Speed, Fixed Condition Runs: Runs 1, 2, 3, 9, 10, 14, 15, 16 and 17
2. Zero Speed, Open Seaway Run: Run 19
3. Mooring Runs: Runs 4, 5, 6, 11, 12, 13 and 18
4. Surf Crossing Runs: Runs S-1 to S-20

TABLE 2

| CONFIGURATION                  | REFERENCE |
|--------------------------------|-----------|
| No containers                  | -         |
| Two each 10,420 lb. containers | Figure 11 |
| Two each 4,700 lb. containers  | Figure 12 |
| One each 10,420 lb. container  | Figure 13 |

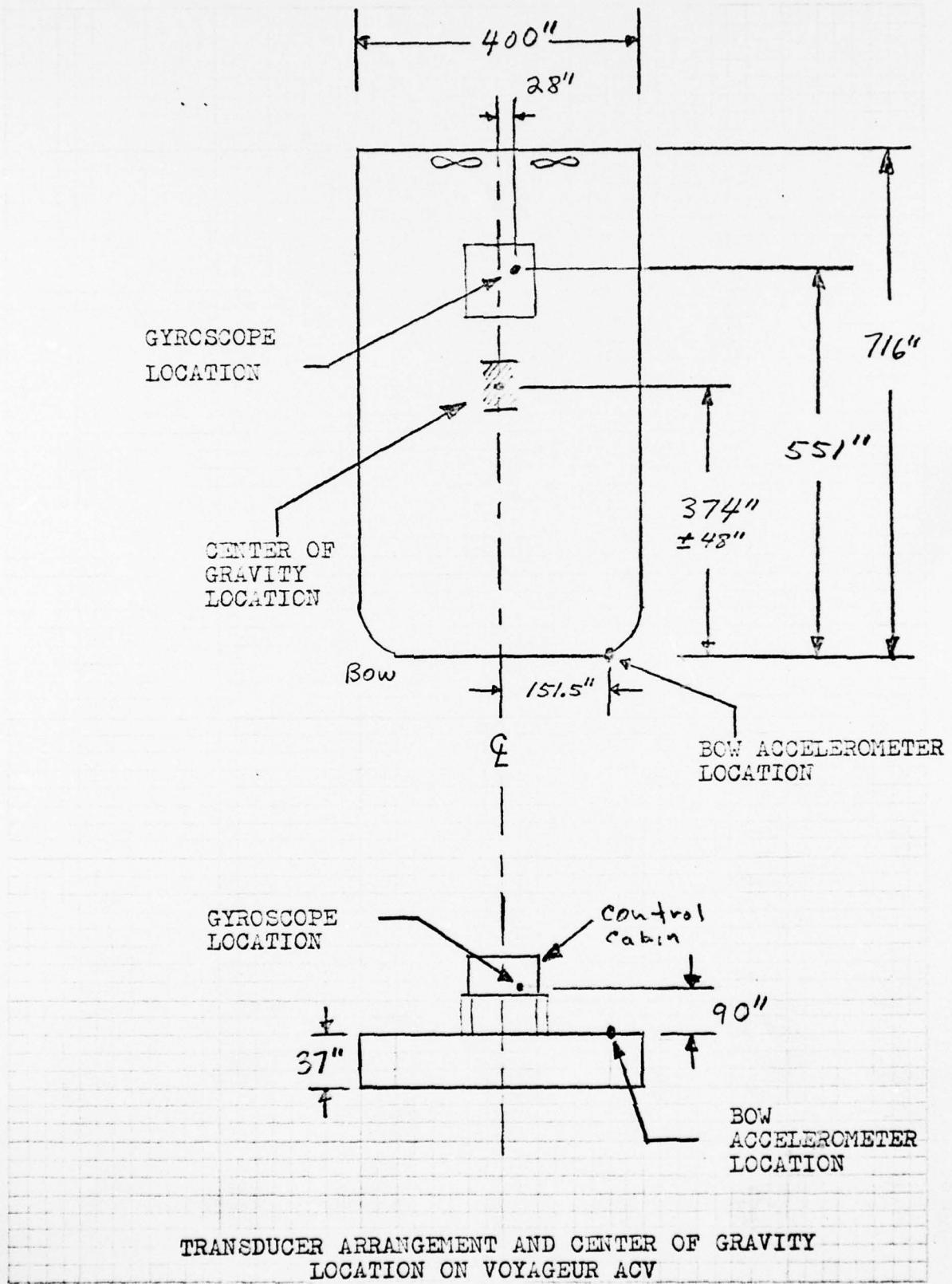


FIGURE 1

GP-100001



**PORTABLE  
DATA  
ACQUISITION  
SYSTEM  
(PODAS)**

**SPECIFICATIONS**

**SIZE:**

|                             |                   |
|-----------------------------|-------------------|
| Signal Conditioning Package | 18 by 13 by 9 in. |
| Tape Recorder Package       | 18 by 13 by 9 in. |

**WEIGHT:**

|                             |   |
|-----------------------------|---|
| Signal Conditioning Package | 33 lb   |
| Tape Recorder Package       | 39 lb (with battery)<br>30 lb (without battery) |

**POWER:**

22 to 26 Vdc at 1.25 amp nominal

**INTERNAL BATTERY LIFE:**

2.5 to 3 hr continuous operation  
before recharging

**RECORDING TIME:**

30, 45, or 60 min depending on  
type of cassette used.  
Records on one side only.

**MEASUREMENT RANGE:**

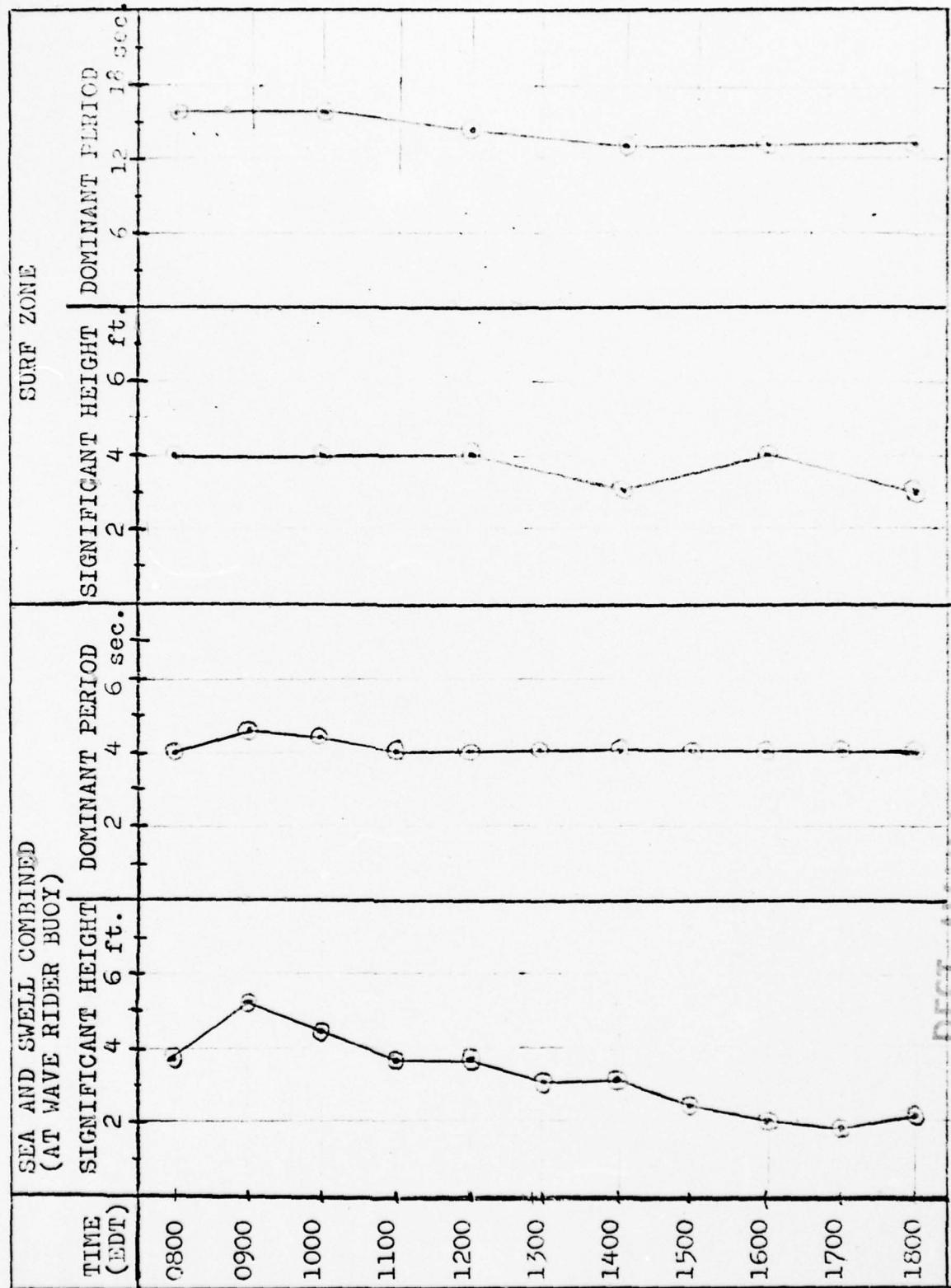
|                     |   |
|---------------------|---|
| Roll Angle          | ± 5 to ± 50 deg full scale<br>0 to 20 Hz  |
| Pitch Angle         | ± 5 to ± 50 deg full scale<br>0 to 20 Hz  |
| Heave Acceleration  | ± 0.1 to ± 2 g full scale<br>0 to 20 Hz   |
| Impact Acceleration | ± 0.5 to ± 50 g full scale<br>0 to 500 Hz |

**SYSTEM ACCURACY:**

|                               |  |
|-------------------------------|--|
| Roll and Pitch Angle          | ± 0.39 deg for ± 5 deg full scale<br>± 1.3 deg for ± 50 deg full scale |
| Heave and Impact Acceleration | ± 2.5 percent of the full scale<br>measurement range                   |

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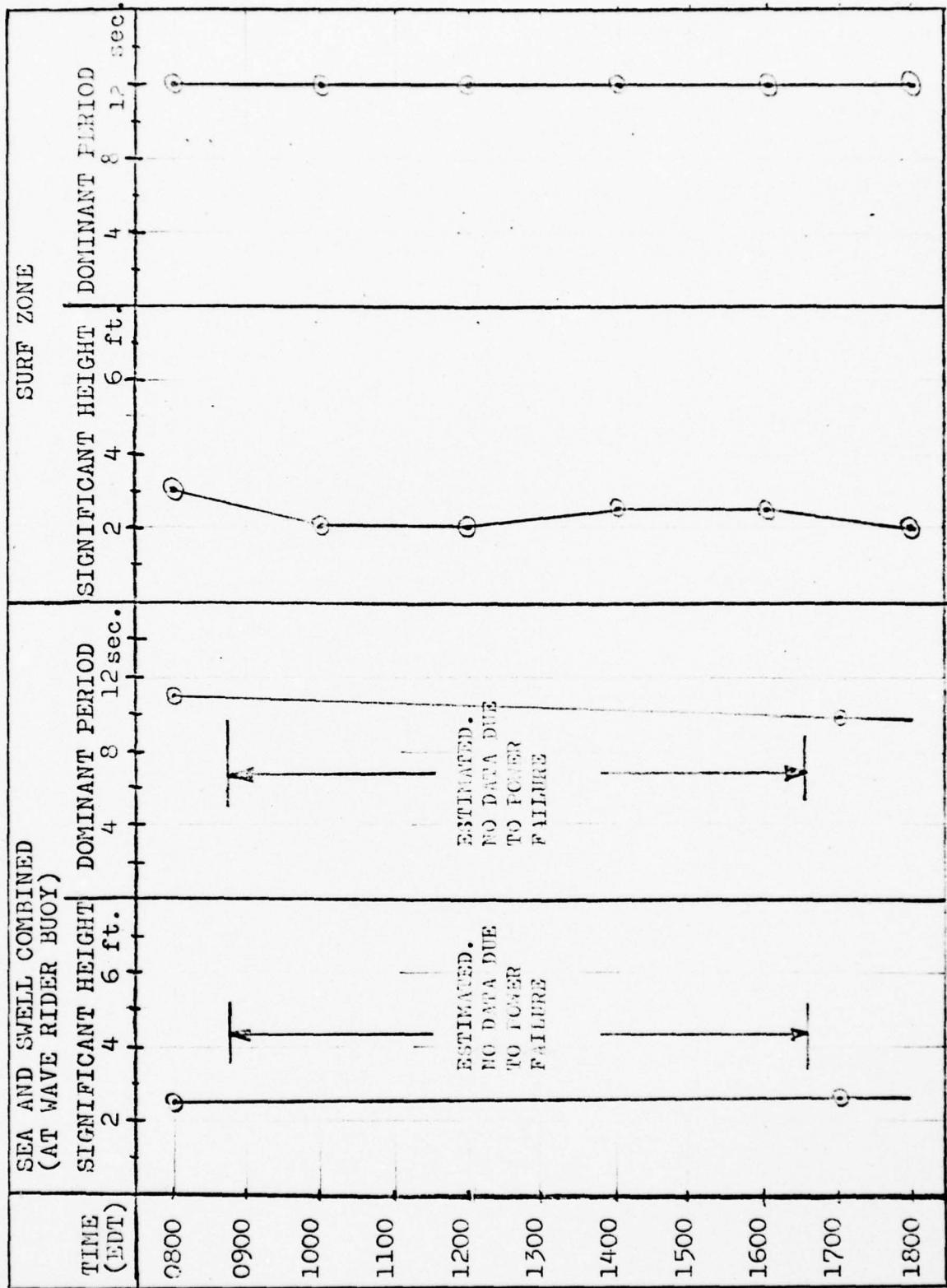
**FIGURE 2**



SEA AND SURF DATA TAKEN FROM FIELD DATA SUMMARY

8 OCTOBER 1972

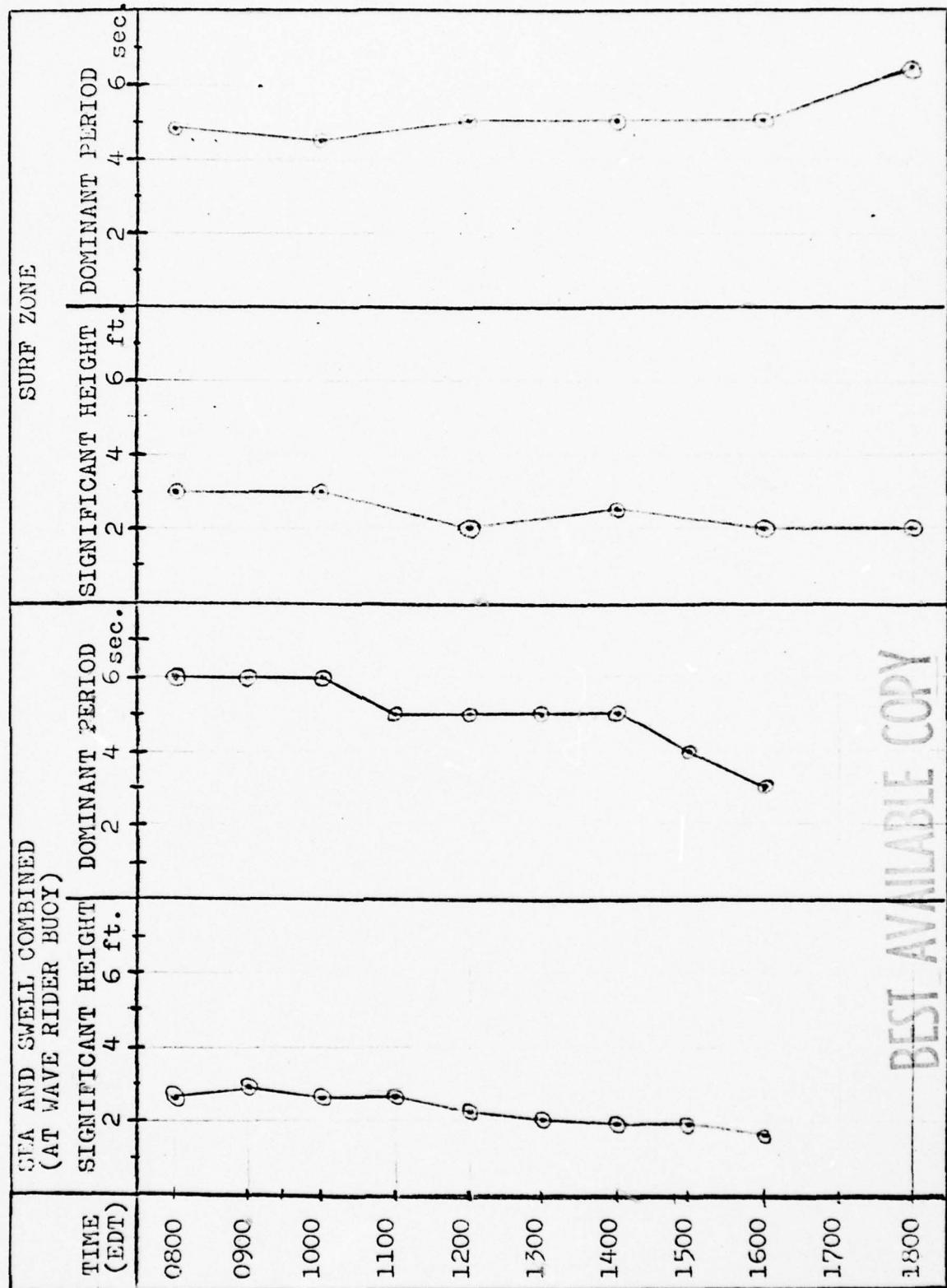
FIGURE 3



SEA AND SURF DATA TAKEN FROM FIELD DATA SUMMARY

9 OCTOBER 1972

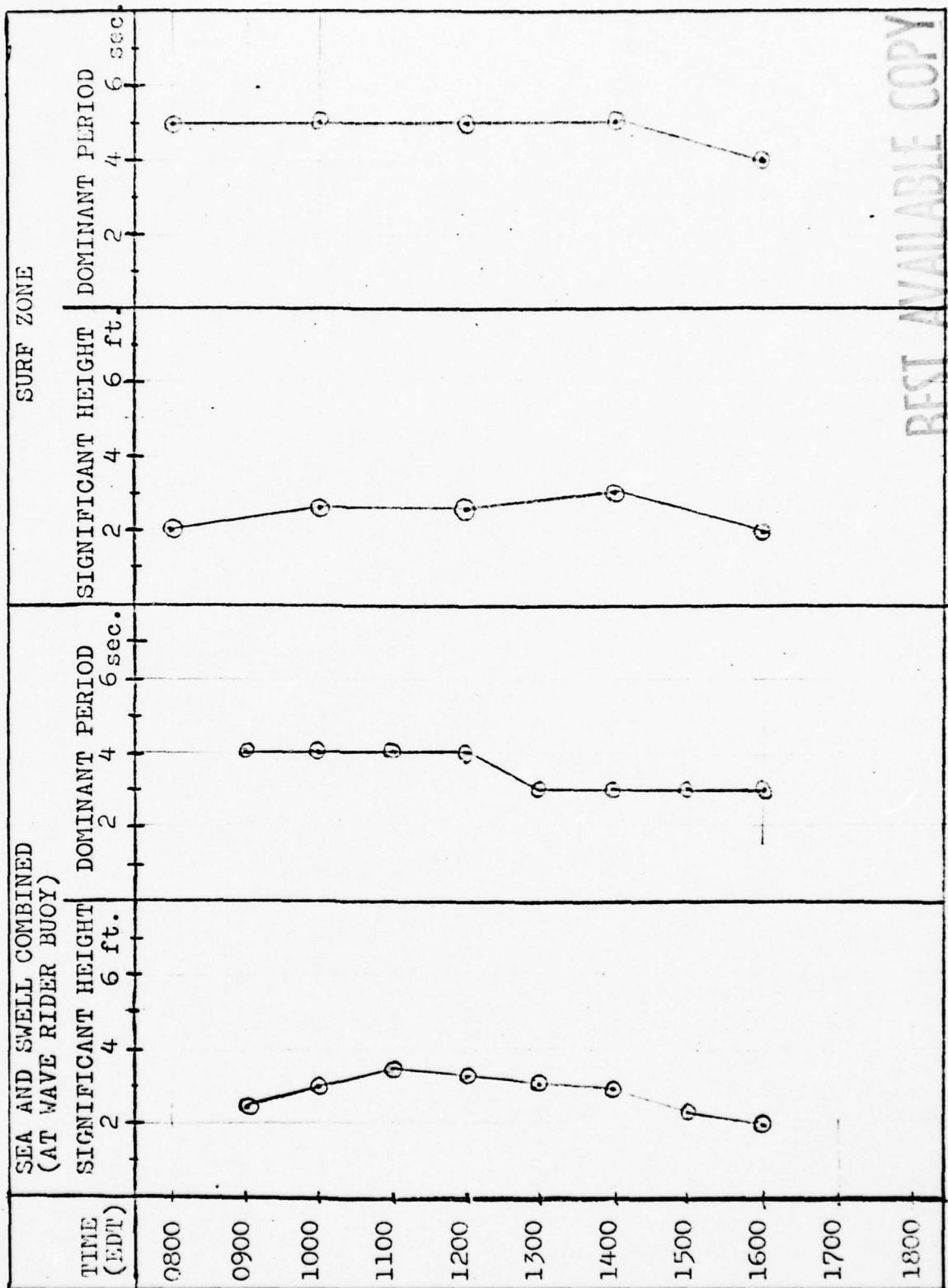
FIGURE 4



SEA AND SURF DATA TAKEN FROM FIELD DATA SUMMARY

11 OCTOBER 1972

FIGURE 5



SEA AND SURF DATA TAKEN FROM FIELD DATA SUMMARY

13 OCTOBER 1972

FIGURE 6

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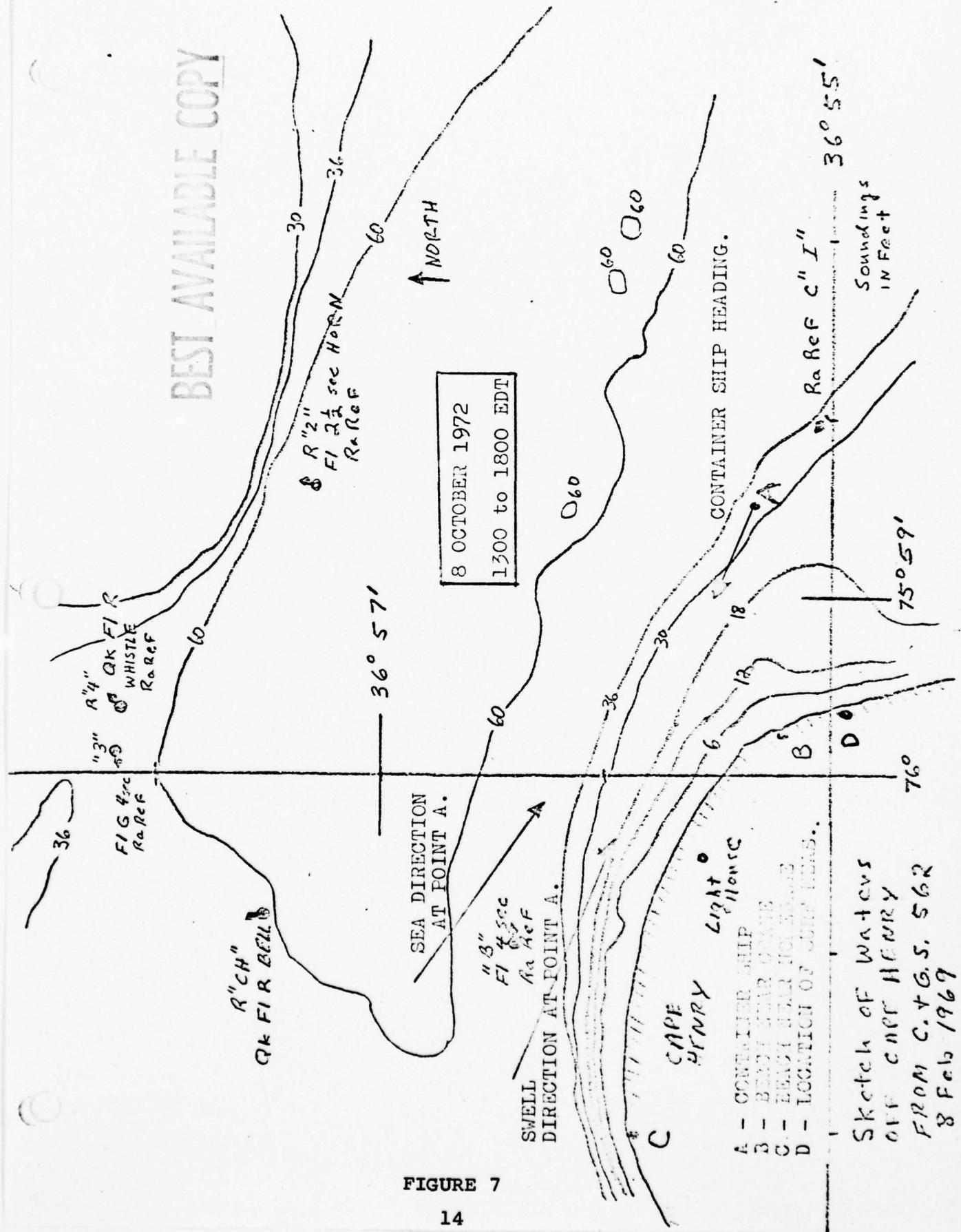


FIGURE 7

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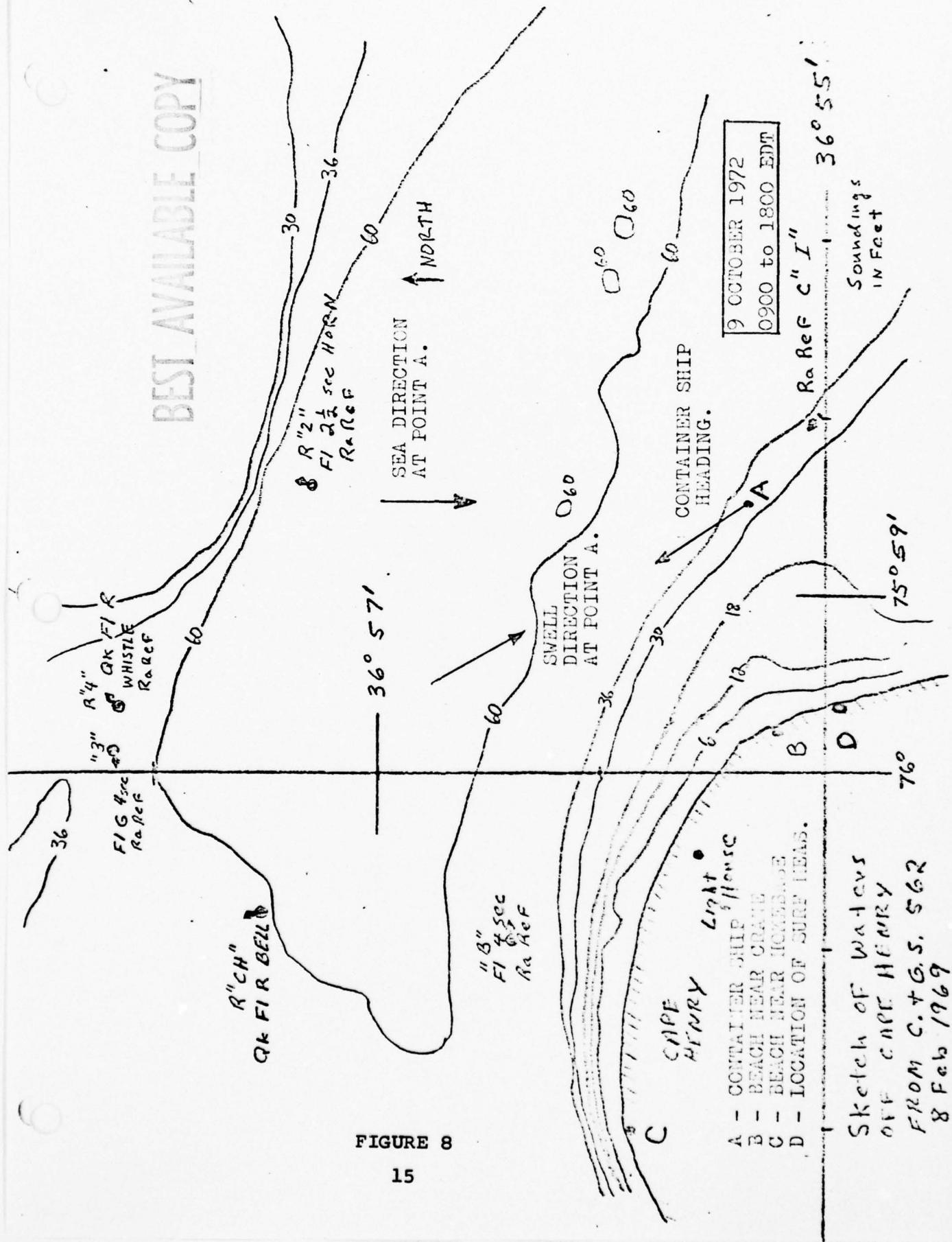


FIGURE 8

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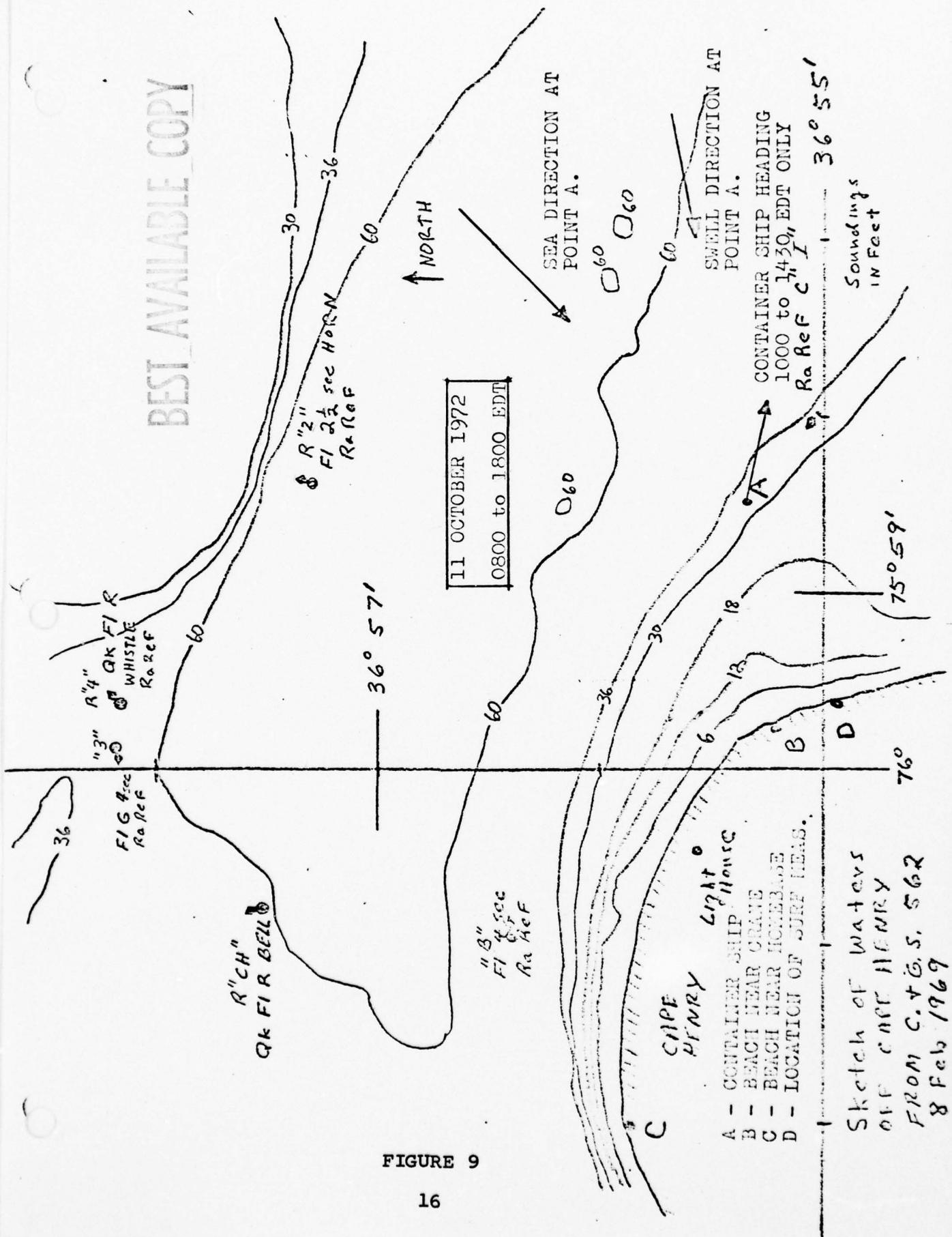


FIGURE 9

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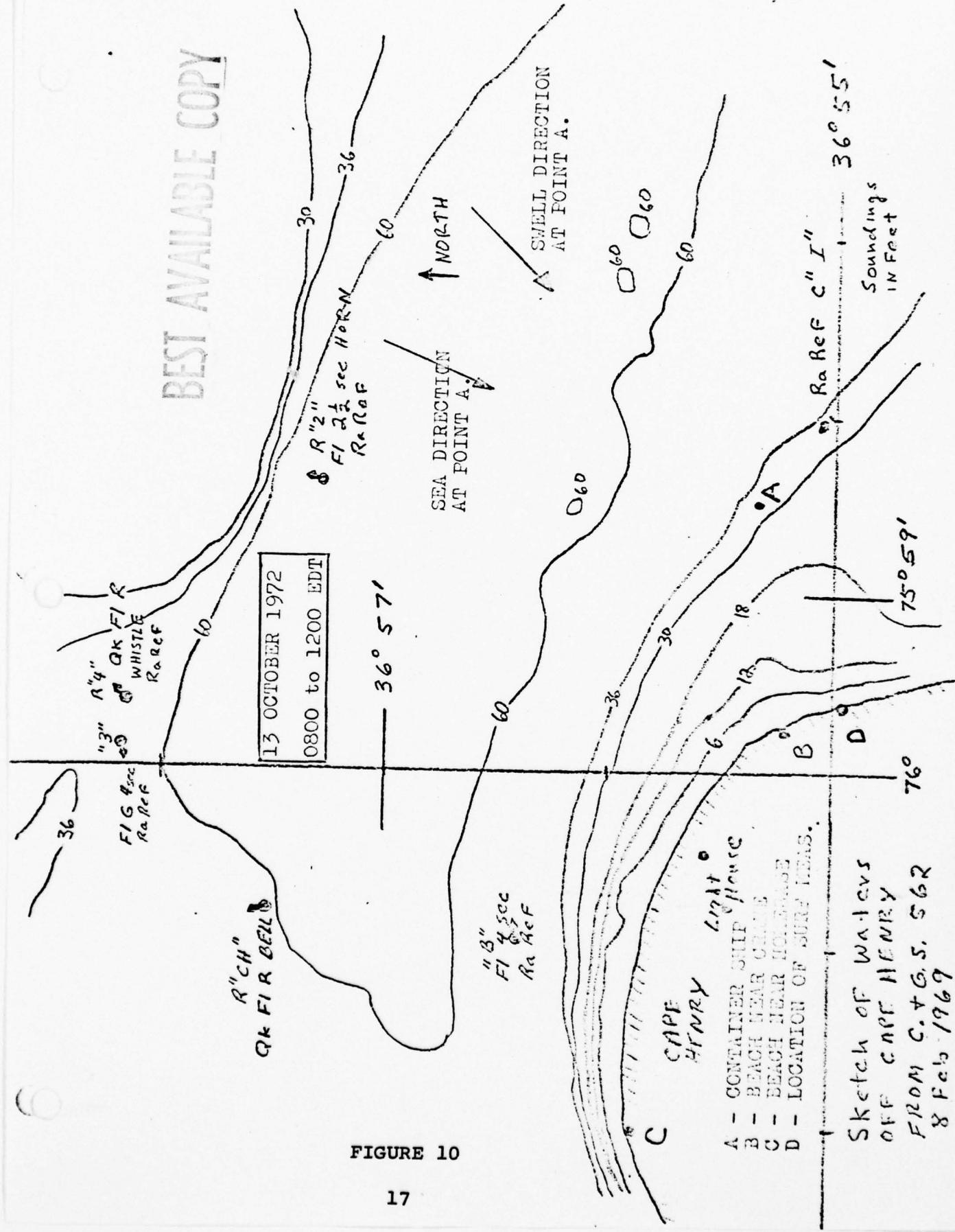
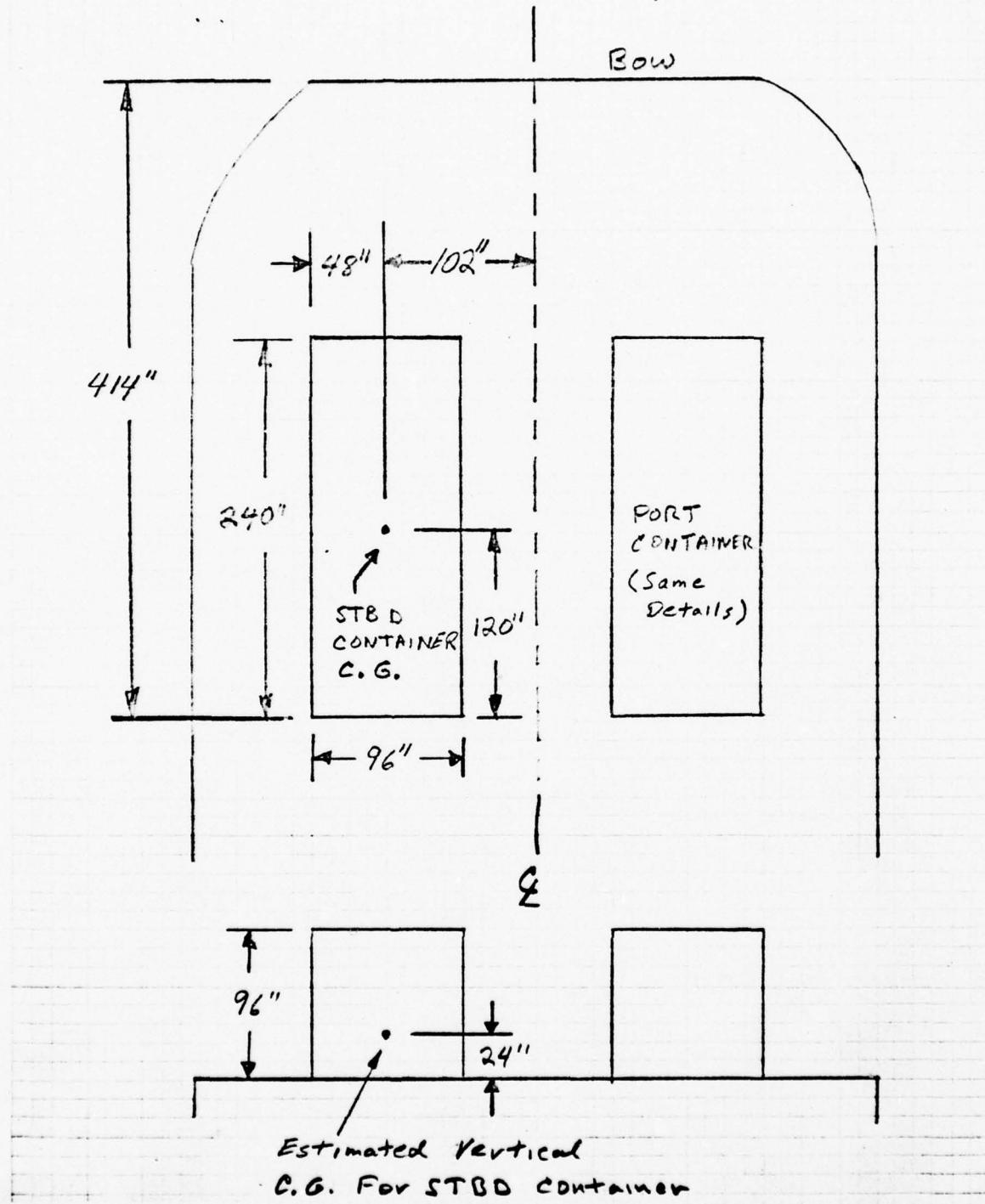


FIGURE 10

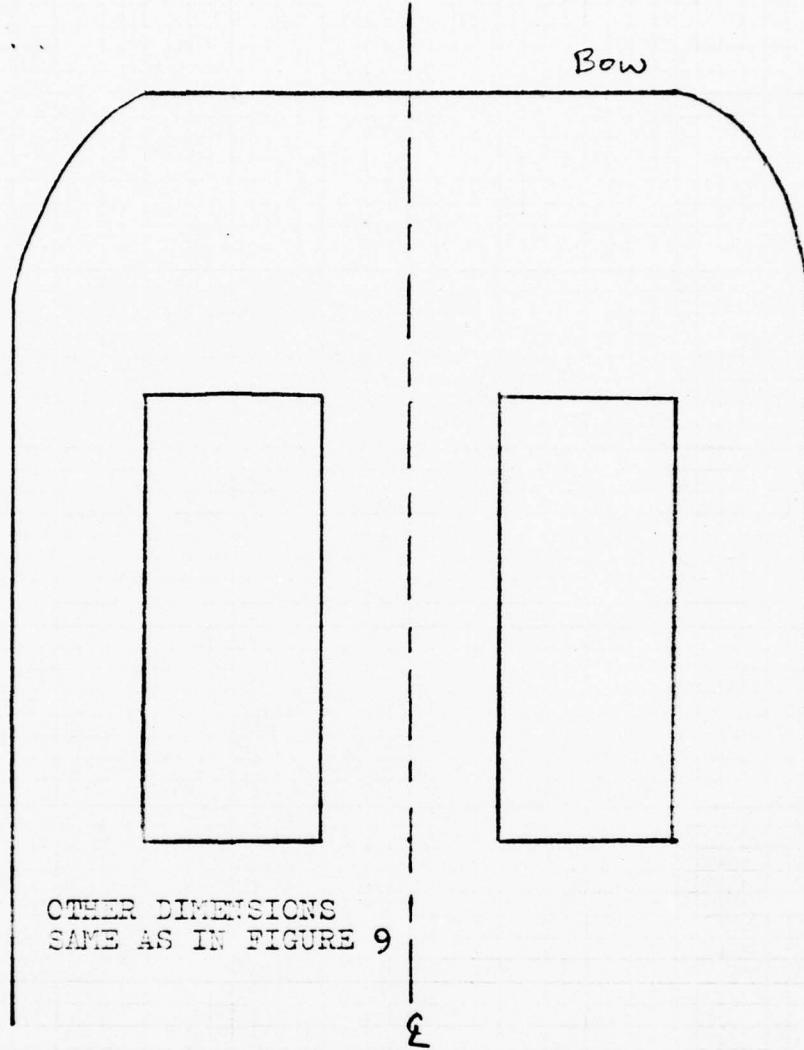
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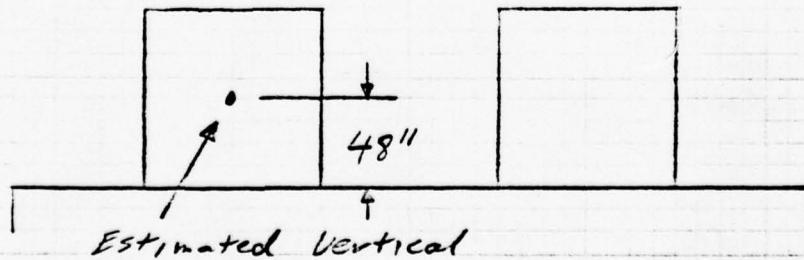
CARGO: 20840 pounds, located along Center Line, 294 inches from Bow and 24 inches above Deck.

CARGO CONFIGURATION FOR TWO EACH 10420 POUND CONTAINERS  
FIGURE 11

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OTHER DIMENSIONS  
SAME AS IN FIGURE 9



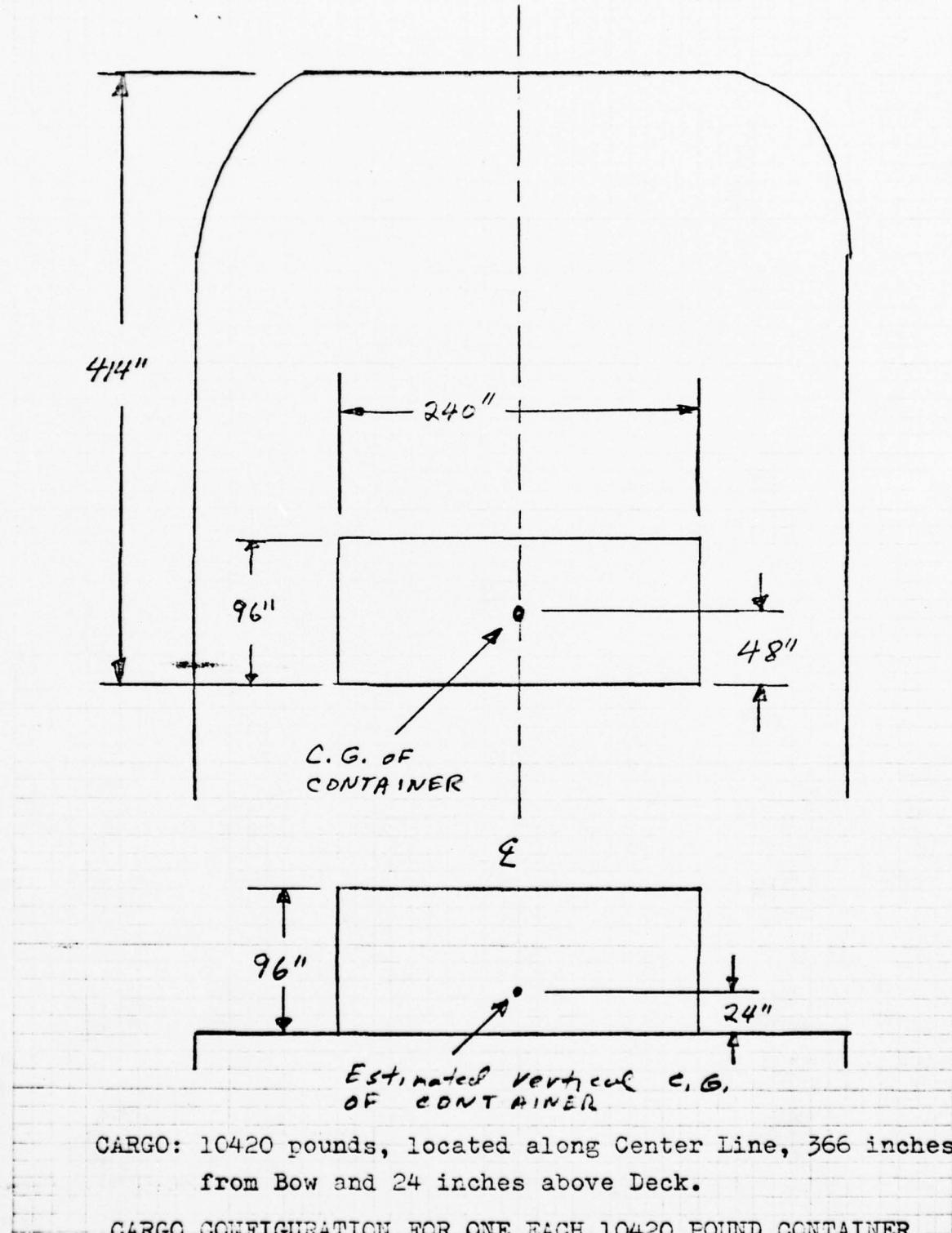
### Estimated Vertical

C. G. FOR STRD CONTAINER

CARGO: 9400 pounds, located along Center Line, 294 inches from Bow and 48 inches above Deck.

CARGO CONFIGURATION FOR TWO EACH 4700 POUND CONTAINERS  
**FIGURE 12**

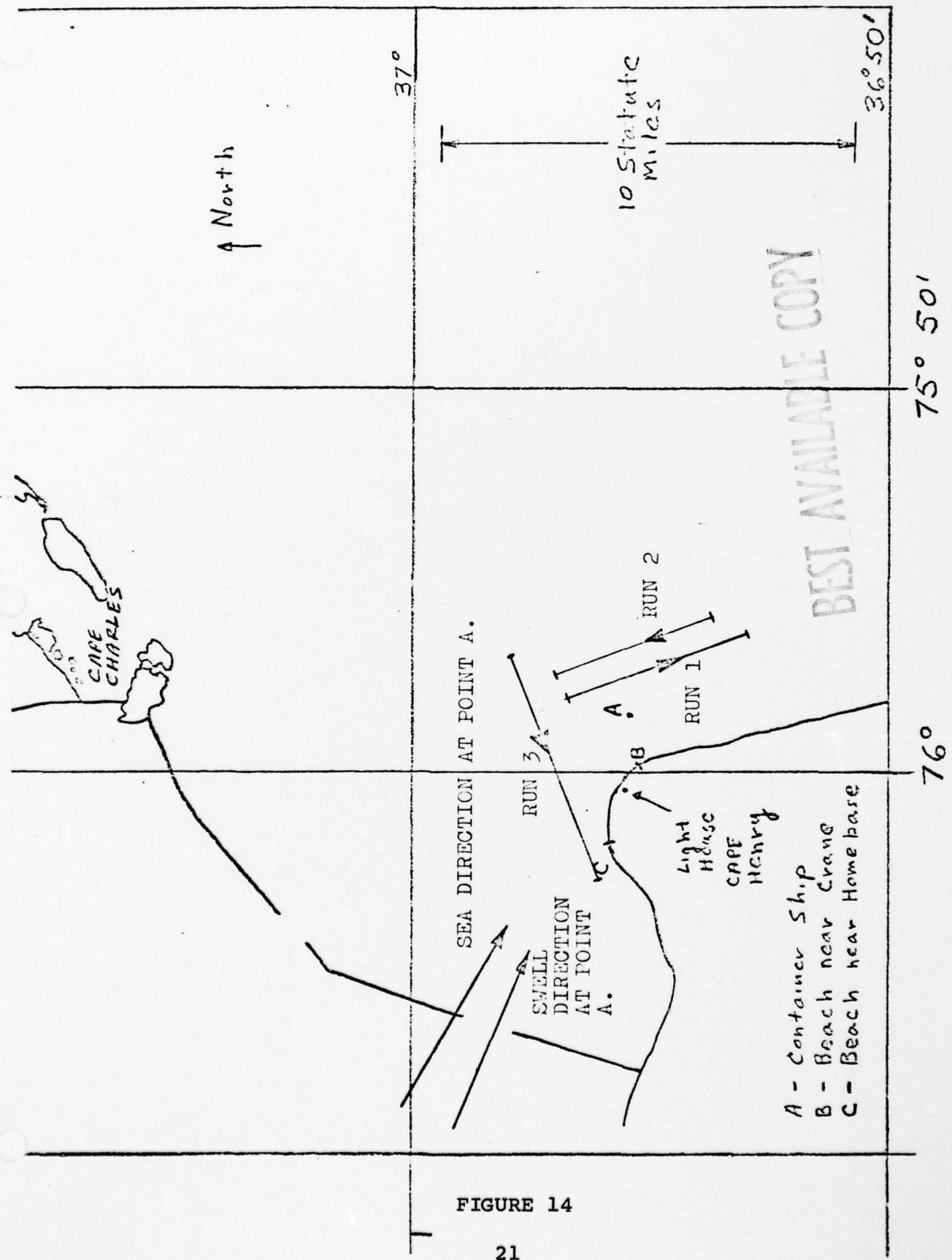
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CARGO: 10420 pounds, located along Center Line, 366 inches from Bow and 24 inches above Deck.

CARGO CONFIGURATION FOR ONE EACH 10420 POUND CONTAINER

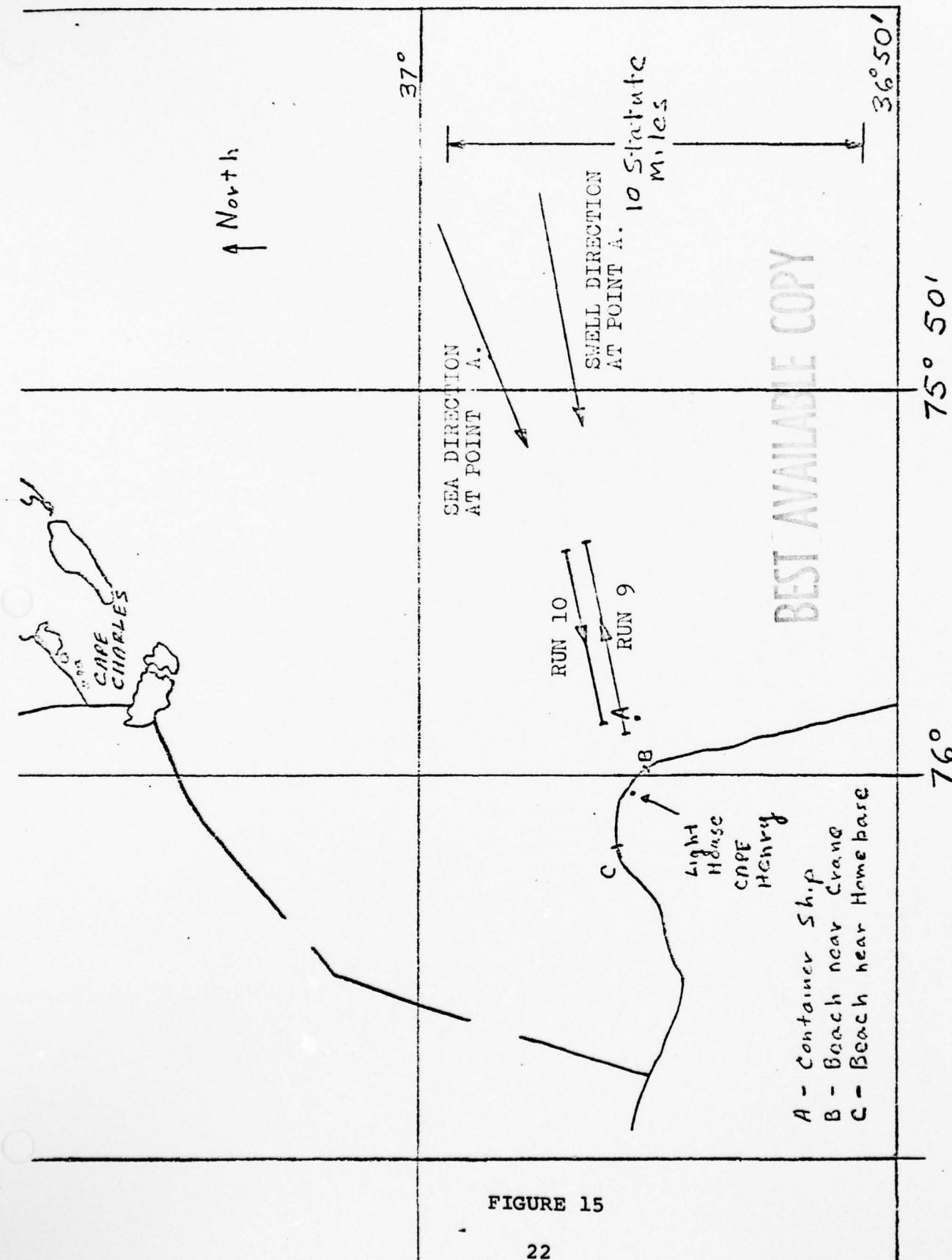
FIGURE 13

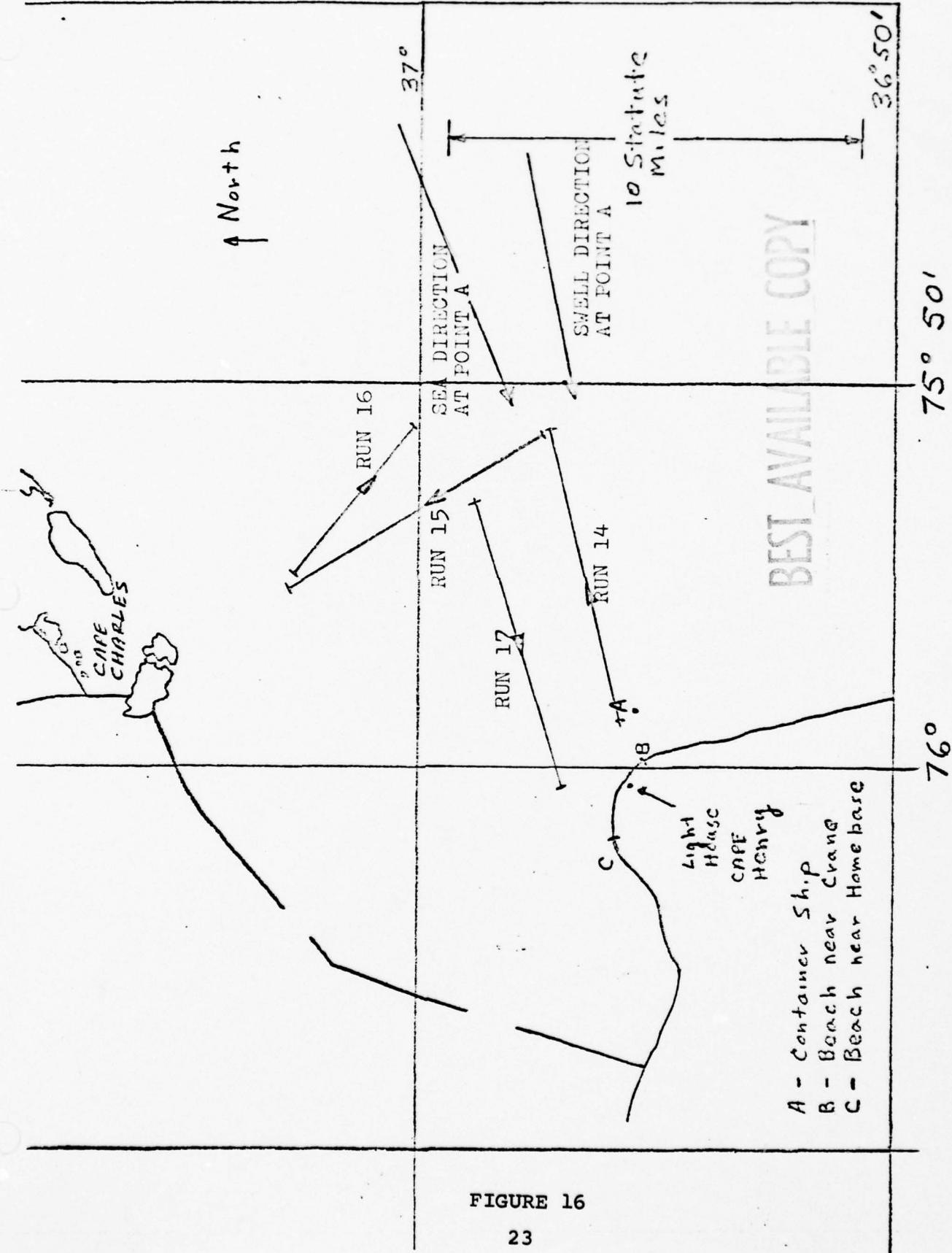


RUNS 1, 2 AND 3

DATE: 8 OCTOBER 1972

TIME: 1250 to 1345 EDT





HIGH SPEED, FIXED CONDITION RUNS

RUNS 1, 2, 3, 9, 10, 14, 15, 16, 17

OPERATIONAL CONDITIONS

RUN # 1

CONDITION: Following Seas at 37 mph

DATE: 8 OCTOBER 1972 TIME: 1253 EDT

CARGO: Two each 10420 pound containers

RUN DURATION: 7.67 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 102

NOTES:

1. Visually estimated sea state 2 with 3 ft. waves.
2. Cargo contained containers numbered 3620 and 3623.
3. This run was made in partly quartering sea conditions.
4. Broad low frequency components present in roll and pitch data.

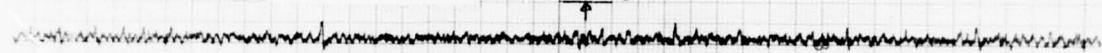
## SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 1

| DERIVED FROM:                                | WAVE HEIGHT FEET | ROLL ANGLE DEGREES | PITCH ANGLE DEGREES | CABIN ACCEL. G'S | BOW ACCEL. G'S |
|--|------------------|--------------------|---------------------|------------------|----------------|
| POWER SPECTRA PSHAFT PROGRAM                 | 3.1              | 3.95               | 2.63                | 0.239            | 0.46           |
| TIME HISTORY PSHAFT <sup>TM</sup> PROGRAM    |                  | 4.3                | 3.0                 | 0.24             | 0.467          |
| DOUBLE AMPLITUDE DISTRIBUTION PSHAFT PROGRAM |                  | 3.82               | 2.58                | 0.219            | 0.397          |
| INTERPRETED VALUE FOR SIGNIFICANT MOTION     |                  | 3.85               | 2.6                 | 0.24             | 0.46           |
| EXTREME DOUBLE AMPLITUDE                     | 5.93             | 3.95               | 0.378               | 0.848            |                |

BOW ACCEL.

1.3g



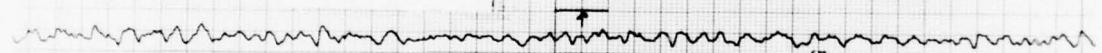
CABIN ACCEL.

0.41g



PITCH

7.8°



ROLL

10.8°



RUN 1



OPERATIONAL CONDITIONS

RUN # 2

CONDITION: Head Seas at 22 mph

DATE: 8 OCTOBER 1972 TIME: 1306 EDT

CARGO: Two each 10420 pound containers

RUN DURATION: 11.52 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 154

NOTES:

1. Notes 1, 2 and 3 for Run 1 apply to this Run.
2. Minor electrical spikes invalidated the double amplitude computations from the Bow acceleration data.

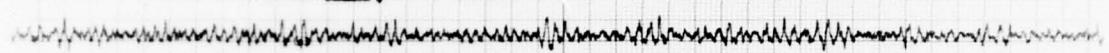
SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 2

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 3.1                 | 5.22                  | 3.06                   | 0.305               | 0.568             |
| TIME HISTORY<br>PSHAFT PROGRAM                     |                     | 5.38                  | 3.51                   | 0.314               | 0.617             |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM |                     | 4.98                  | 3.15                   | 0.303               | —                 |
| INTERFERED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION   |                     | 5.2                   | 3.1                    | 0.3                 | 0.60              |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | 8.47                | 4.76                  | 4.99                   | —                   | —                 |

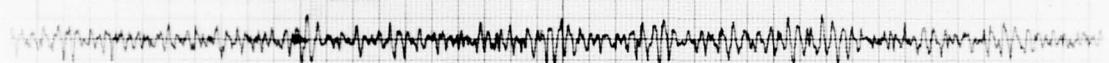
BOW ACCEL.

1.3g



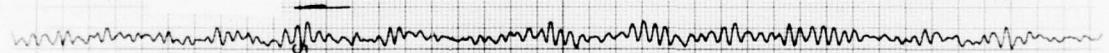
CABIN ACCEL.

0.49g



PITCH

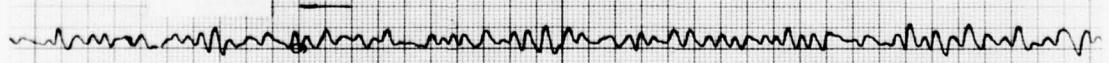
7.8°



Run 2

ROLL

10.8°



RUN 2

OPERATIONAL CONDITIONS

RUN # 3

CONDITION: Beam Seas at 20 mph

DATE: 8 OCTOBER 1972 TIME: 1324 EDT

CARGO: Two each 10420 pound containers

RUN DURATION: 18.98 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 253

NOTES:

1. Notes 1, 2 and 3 for Run 1 apply to this Run.

## SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 3

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH. ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|-------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 3.08                | 4.29                  | 2.51                    | 0.241               | 0.484             |
| TIME HISTORY<br>PSHAFT PROGRAM                     |                     | 4.53                  | 3.51                    | 0.252               | 0.532             |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM |                     | 4.22                  | 2.75                    | 0.236               | 0.509             |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION  |                     | 4.25                  | 2.65                    | 0.24                | 0.49              |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | 8.16                | 5.58                  | 0.576                   | 1.286               |                   |

BOW ACCEL.

1.3g

CABIN ACCEL.

0.41g

PITCH

7.8°

Run 3

ROLL

10.9°

RUN 3

OPERATIONAL CONDITIONS

RUN # 9

CONDITION: Head Seas at 37 mph

DATE: 11 OCTOBER 1972

TIME: 0938 EDT

CARGO: No containers

RUN DURATION: 9.17 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 122

NOTES:

1. Visually estimated sea state 2 with 4 ft. waves.

## SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN #9

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 2.71                | 3.28                  | 6.1                    | 0.666               | 1.45              |
| TIME HISTORY<br>PSHAFT PROGRAM                     |                     | 3.56                  | 6.25                   | 0.685               | 1.53              |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM | 3.3                 | 5.97                  |                        | 0.658               | 1.42              |
| INTERFERED<br>VALUE FOR<br>SIGNIFICANT<br>NOTION   | 3.3                 | 6.1                   |                        | 0.67                | 1.45              |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | 6.05                | 9.83                  | 1.1                    |                     | 2.27              |

 1.34  
BOW ACCEL.

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 0.419  
CABIN ACCEL.

 7.80  
PITCH

Run 9  
 10.8°

ROLL

RUN 9

OPERATIONAL CONDITIONS

RUN # 10

CONDITION: Following Seas at 41 mph

DATE: 11 OCTOBER 1972

TIME: 0949 EDT

CARGO: No containers

RUN DURATION: 6.4 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 85

NOTES:

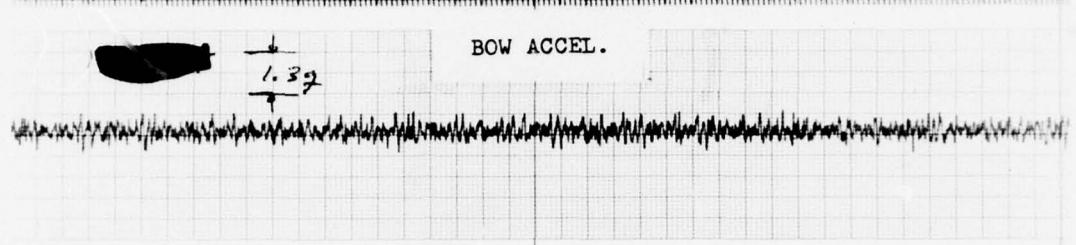
1. Visually estimated sea state 2 with 4 ft. waves.
2. Broad low frequency components present in roll and pitch data. This condition invalidated the computations from the power spectra for the roll data.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN #10

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 2.78                | —                     | 4.02                   | 0.317               | 0.773             |
| TIME HISTORY<br>PSHAFT PROGRAM                     |                     | 3.59                  | 4.64                   | 0.32                | 0.787             |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM |                     | 2.78                  | 3.77                   | 0.28                | 0.585             |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>ECTION  | 2.9                 | 4.0                   |                        | 0.32                | 0.77              |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | 4.36                | 6.08                  |                        | 0.514               | 1.213             |

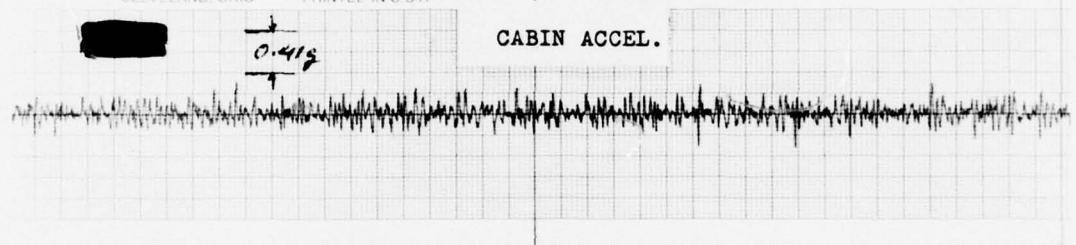
[REDACTED] 1.32 BOW ACCEL.



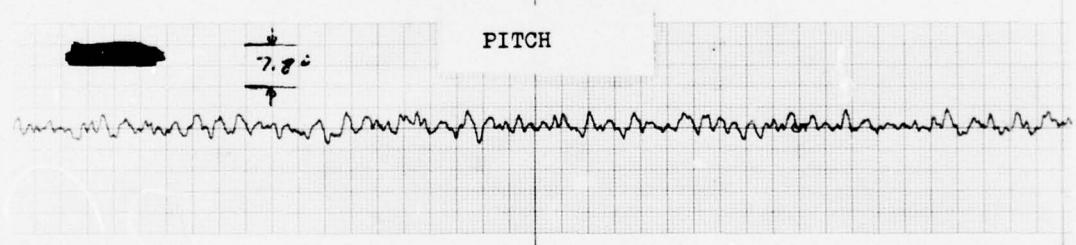
BRUSH INSTRUMENTS DIVISION, GOULD INC.

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[REDACTED] 0.418 CABIN ACCEL.



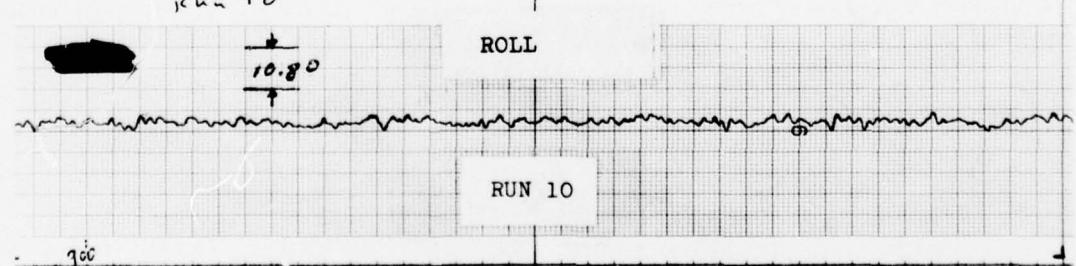
[REDACTED] 7.8° PITCH



Run 10

[REDACTED] 10.8° ROLL

RUN 10



900

OPERATIONAL CONDITIONS

RUN # 14

CONDITION: Head Seas at 44 mph

DATE: 11 OCTOBER 1972

TIME: 1456 EDT

CARGO: No containers

RUN DURATION: 10.23 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 136

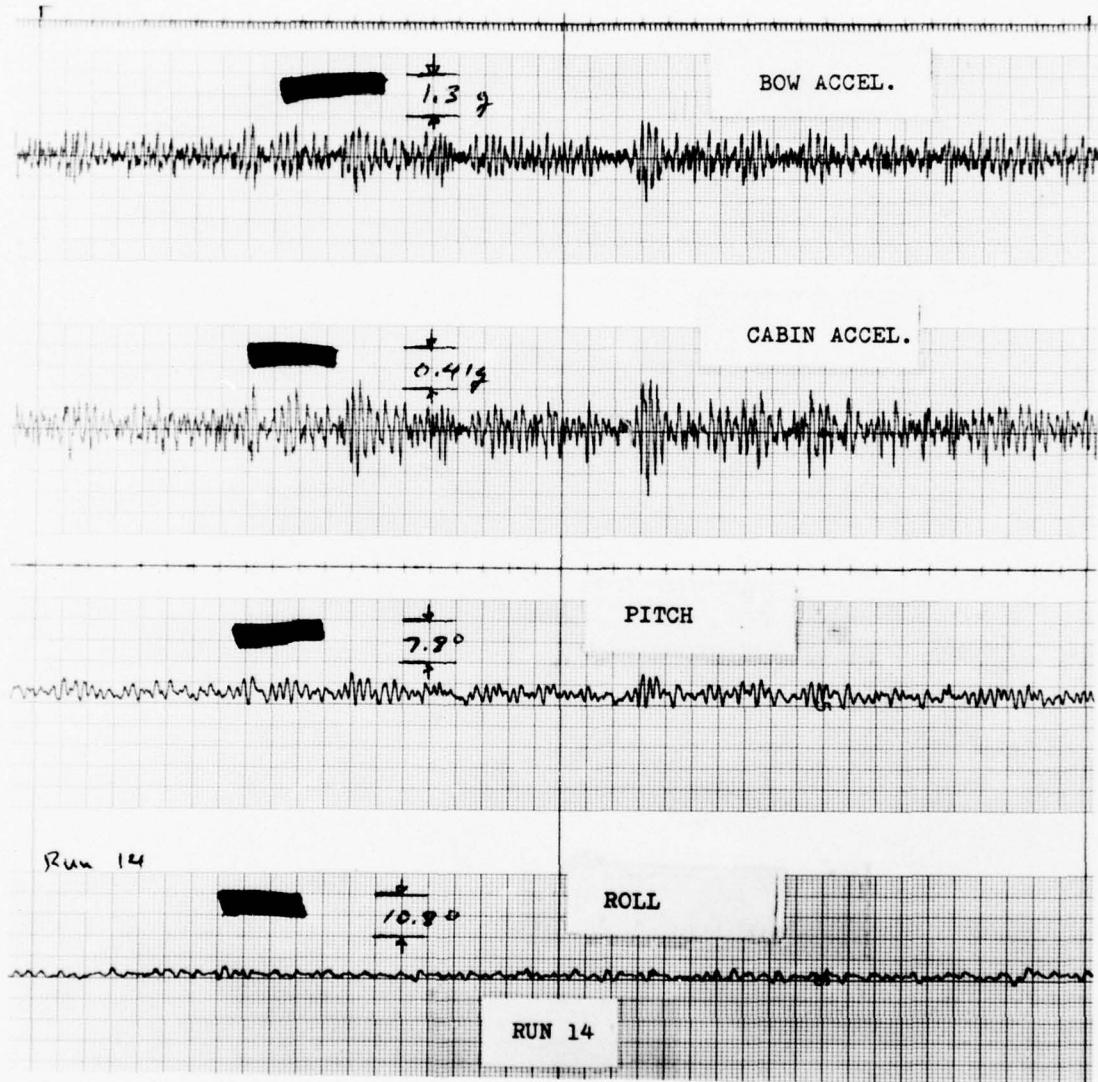
NOTES:

1. Visually estimated sea state 2 with 3 ft. waves.
2. Broad low frequency components present in roll data.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 14

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 1.79                | 2.59                  | 4.12                   | 0.537               | 1.21              |
| TIME HISTORY<br>PSHAFT PROGRAM                     |                     | 2.97                  | 4.5                    | 0.558               | 1.32              |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM |                     | 2.46                  | 3.02                   | 0.539               | 1.202             |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION  |                     | 2.6                   | 4.1                    | 0.54                | 1.21              |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | 4.11                | 6.26                  | 1.03                   | 2.309               |                   |



OPERATIONAL CONDITIONS

RUN # 15

CONDITION: Beam Seas at 49 mph

DATE: 11 OCTOBER 1972

TIME: 1507 EDT

CARGO: No containers

RUN DURATION: 8.53 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 114

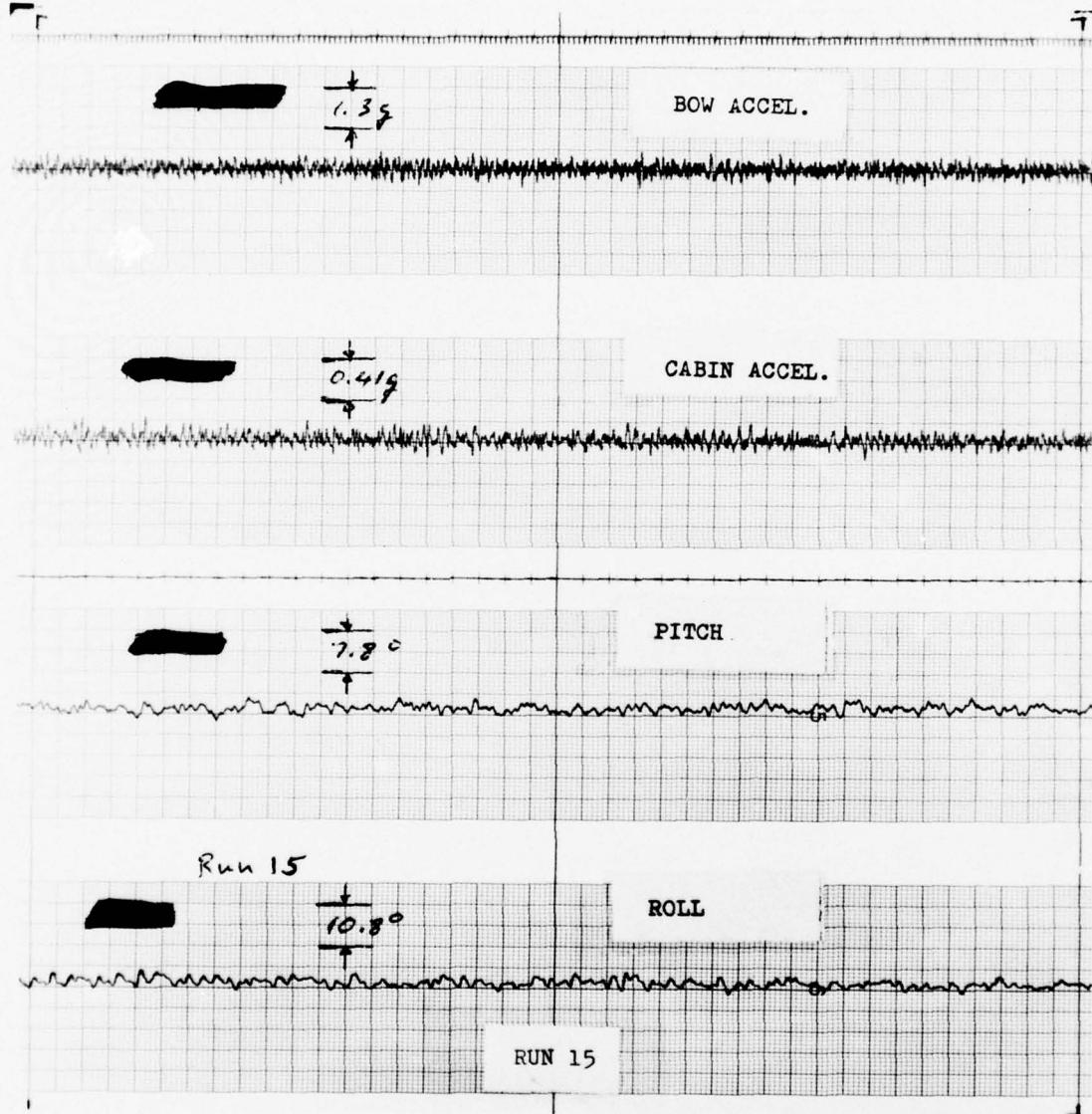
NOTES:

1. Visually estimated sea state 2 with 3 ft. waves.
2. Run condition contained 20% of Forward Quartering Seas.
3. Broad low frequency components present in roll and pitch data. This condition invalidated the computations from the power spectrum for the pitch data.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 15

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH. ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|-------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 1.79                | 2.81                  | —                       | 0.22                | 0.62              |
| TIME HISTORY<br>PSHAFT PROGRAM                     |                     | 3.96                  | 3.51                    | 0.22                | 0.625             |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM |                     | 3.17                  | 2.05                    | 0.194               | 0.517             |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION  |                     | 3.1                   | 2.4                     | 0.2                 | 0.62              |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | 5.71                | 3.53                  | 0.436                   | 0.89                |                   |



## OPERATIONAL CONDITIONS

RUN # 16

CONDITION: Forward Quartering Seas at 46 mph

DATE: 11 OCTOBER 1972 TIME: 1517 EDT

**CARGO:** No containers

RUN DURATION: 5.53 MINUTES

## POWER SPECTRA, DEGREES OF FREEDOM: 74

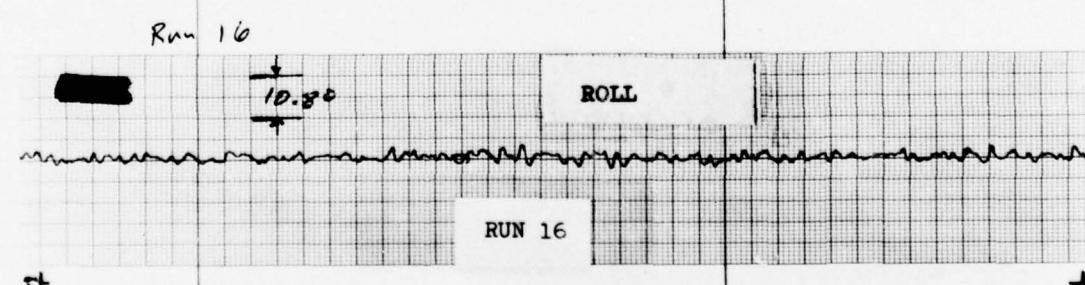
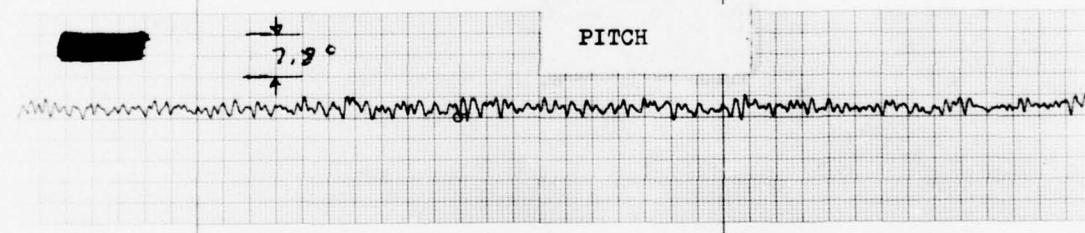
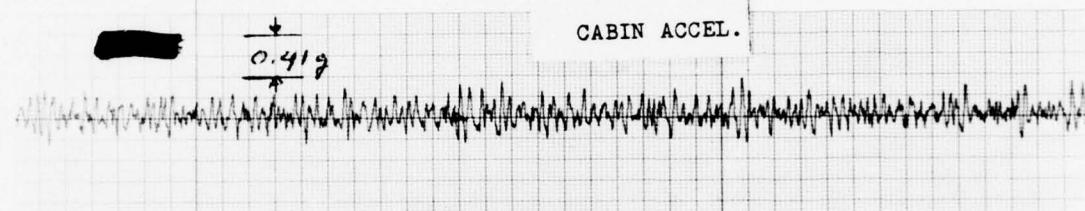
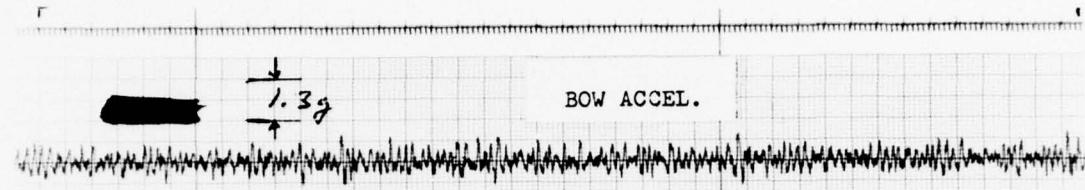
## NOTES :

1. Visually estimated sea state 2 with 3 ft. waves.
2. Broad low frequency components present in roll data.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 16

| DERIVED<br>FROM:                                  | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH. ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|---|---------------------|-----------------------|-------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                   | 1.81                | 3.14                  | 3.01                    | 0.405               | 0.981             |
| TIME HISTORY<br>PSHAFT PROGRAM                    |                     | 3.076                 | 3.54                    | 0.405               | 0.99              |
| DOUBLE AMPLITUDE<br>DISTRIBUTION                  |                     | 3.5                   | 3.04                    | 0.38                | 0.89              |
| PSHAFT PROGRAM                                    |                     |                       |                         |                     |                   |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION |                     | 3.4                   | 3.0                     | 0.4                 | 0.98              |
| EXTREME<br>DOUBLE<br>AMPLITUDE                    | 5.71                | 4.6                   | 0.533                   | 1.551               |                   |



OPERATIONAL CONDITIONS

RUN # 17

CONDITION: Following Seas at 47 mph

DATE: 11 OCTOBER 1972

TIME: 1526 EDT

CARGO: No containers

RUN DURATION: 8.53 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 114

NOTES:

1. Visually estimated sea state 2 with 3 ft. waves.
2. Broad low frequency components present in roll and pitch data. This condition invalidated the computations from the power spectra for the roll data.
3. Minor electrical spikes invalidated the double amplitude computations from the roll and pitch data.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 17

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH. ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|-------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 1.81                | —                     | 2.93                    | 0.276               | 0.671             |
| TIME HISTORY<br>PSHAFT PROGRAM                     |                     | 3.03                  | 3.28                    | 0.277               | 0.679             |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM |                     | —                     | —                       | 0.251               | 0.593             |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION  | 2.5                 | 2.95                  | 0.27                    | 0.67                |                   |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | —                   | —                     | 0.513                   | 1.144               |                   |



ZERO SPEED, OPEN SEAWAY RUN

RUN 19

OPERATIONAL CONDITIONS

RUN # 19

CONDITION: Beam Seas, Zero Speed, Open Seaway, Off Cushion

DATE: 13 OCTOBER 1972 TIME: 0939 EDT

CARGO: No containers

RUN DURATION: 3.62 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 18

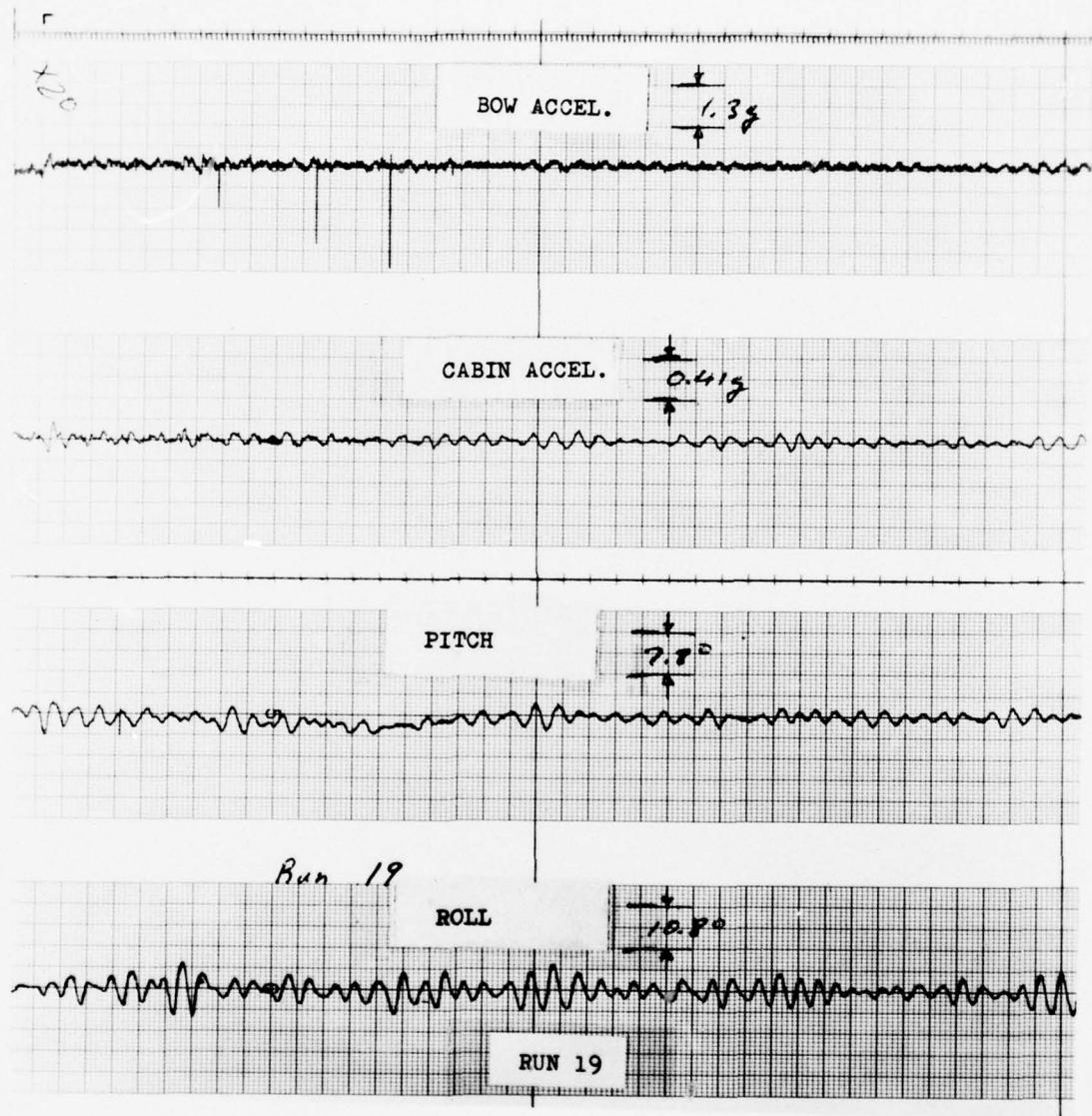
NOTES:

1. High noise levels and low signal levels invalidated all standard computations from the Bow acceleration data.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN #19

| DERIVED<br>FROM:                                    | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|---|---------------------|-----------------------|------------------------|---------------------|-------------------|
| POWER SPECTRA<br>P-SHAFT PROGRAM                    | 3.25                | 8.57                  | 2.79                   | 0.131               | —                 |
| TIME HISTORY<br>P-SHAFT PROGRAM                     |                     | 8.69                  | 3.4                    | 0.136               | —                 |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>P-SHAFT PROGRAM |                     | 8.24                  | 2.88                   | 0.129               | —                 |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION   |                     | 8.5                   | 2.84                   | 0.132               | 0.201             |
| EXTREME<br>DOUBLE<br>AMPLITUDE                      | 11.36               | 4.71                  | 0.197                  | —                   |                   |



MOORING RUNS

RUNS 4, 5, 6, 11, 12, 13, 18

OPERATIONAL CONDITIONS

RUN # 4

CONDITION: Mooring in Head Seas, on Partial cushion

DATE: 9 OCTOBER 1972 TIME: 1204 EDT

CARGO: Two each 4700 pound containers

RUN DURATION: 18.33 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 92

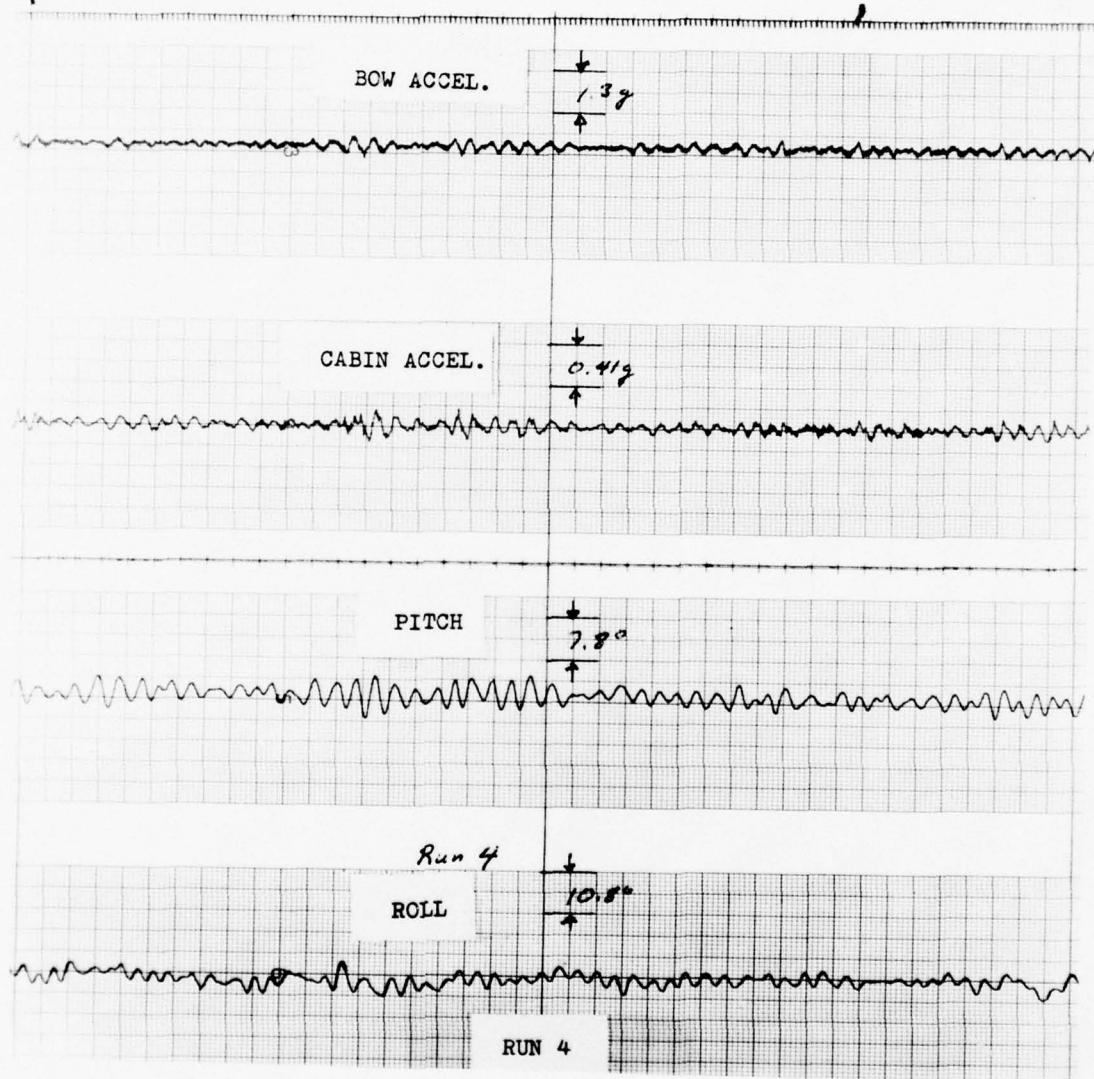
NOTES:

1. Craft station keeping next to WARRIOR.
2. Retrograde of cargo was attempted.
3. Visually estimated 6 ft. relative motion between VOYAGEUR and WARRIOR.
4. Minor electrical spikes invalidated the double amplitude computations for the Bow acceleration data.
5. VOYAGEUR was not sheltered from wave action by the WARRIOR.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN #4

| DERIVED<br>FROM:                                    | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|---|---------------------|-----------------------|------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PRAHAFT PROGRAM                    | 2.5<br>(Estimated)  | 5.18                  | 5.66                   | 0.181               | 0.316             |
| TIME HISTORY<br>PRAHAFT PROGRAM                     |                     | 7.1                   | 6.06                   | 0.155               | 0.344             |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PRAHAFT PROGRAM |                     | 5.29                  | 5.76                   | 0.174               | —                 |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION   |                     | 5.24                  | 5.89                   | 0.18                | 0.325             |
| EXTREME<br>DOUBLE<br>AMPLITUDE                      | 8.55                | 11.8                  | 0.339                  | —                   |                   |



OPERATIONAL CONDITIONS

RUN # 5

CONDITION: Mooring in Head Seas, Off cushion

DATE: 9 OCTOBER 1972 TIME: 1529 EDT

CARGO: No containers

RUN DURATION: 7.47 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 37

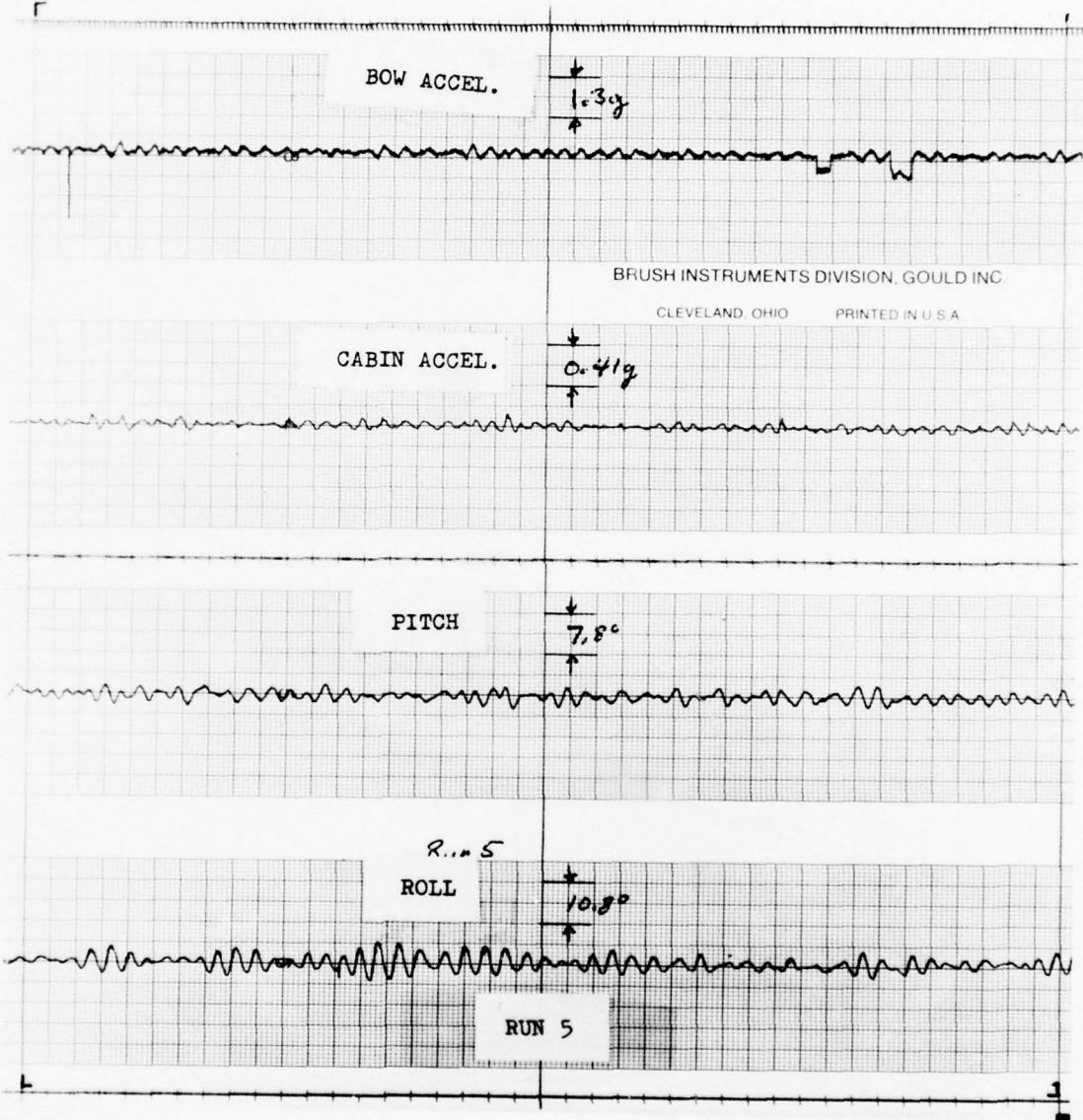
NOTES:

1. Craft station keeping next to WARRIOR.
2. Large electrical disturbances offset the bow acceleration data several times. This disturbance invalidated the time history and double amplitude computations for this data.
3. VOYAGEUR was not sheltered from wave action by the WARRIOR.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 5

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH. ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|-------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 2.5<br>(Estimated)  | 6.07                  | 3.1                     | 0.106               | 0.305             |
| TIME HISTORY<br>PSHAFT PROGRAM                     | 6.86                | 3.17                  | 0.11                    | 0.552               | —                 |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM | 6.3                 | 2.99                  | 0.101                   | —                   | —                 |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>VECTION | 6.18                | 3.07                  | 0.106                   | 0.305               | —                 |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | 9.82                | 4.07                  | 0.182                   | —                   | —                 |



OPERATIONAL CONDITIONS

RUN # 6

CONDITION: Mooring in Head Seas, Off cushion

DATE: 9 OCTOBER 1972 TIME: 1540 EDT

CARGO: One each 10420 pound container

RUN DURATION: 8.73 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 44

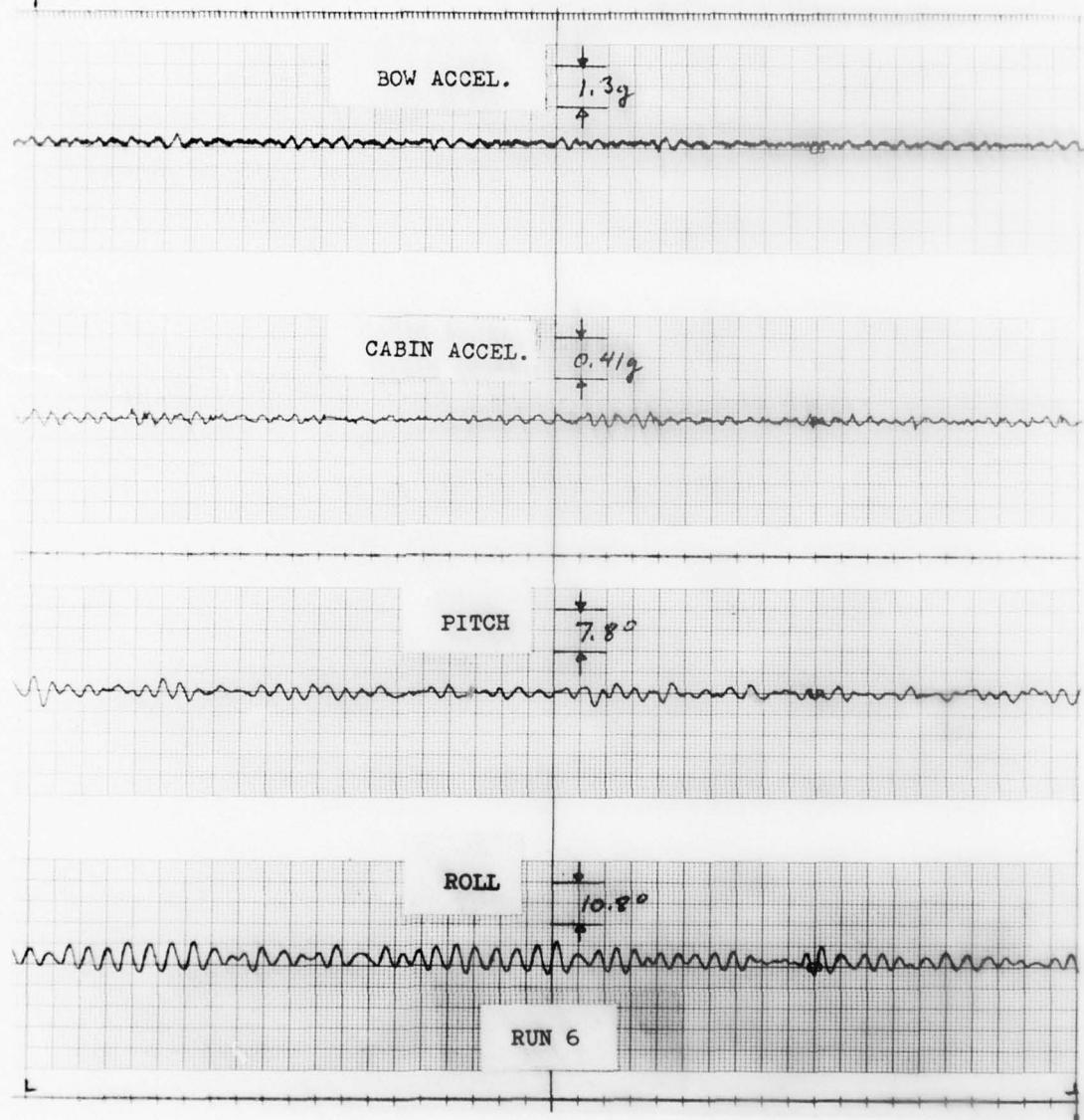
NOTES:

1. Craft station keeping next to WARRIOR.
2. Cargo was on craft only during last 1.23 minutes of run.
3. VOYAGEUR was not sheltered from wave action by the WARRIOR.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 6

| DERIVED<br>FROM:                                    | WAVE HEIGHT<br>FEET                      | ROLL ANGLE<br>DEGREES | PITCH ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|---|--|-----------------------|------------------------|---------------------|-------------------|
| POWER SPECTRA<br>P.SHAFT PROGRAM                    | ( $2.5^2$ ft. $\times$ 10 <sup>5</sup> ) | 7.11                  | 3.39                   | 0.121               | 0.259             |
| TIME HISTORY<br>P.SHAFT PROGRAM                     |  | 7.22                  | 3.42                   | 0.124               | 0.271             |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>P.SHAFT PROGRAM |  | 6.71                  | 3.24                   | 0.116               | 0.249             |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION   | 7.01                                     | 3.35                  |                        | 0.12                | 0.259             |
| EXTREME<br>DOUBLE<br>AMPLITUDE                      | 8.63                                     | 5.47                  |                        | 0.191               | 0.476             |



OPERATIONAL CONDITIONS

RUN # 11

CONDITION: Mooring on Lee side of WARRIOR, Off cushion

DATE: 11 OCTOBER 1972 TIME: 1011 EDT

CARGO: Two each 4700 pound containers

RUN DURATION: 9.6 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 48

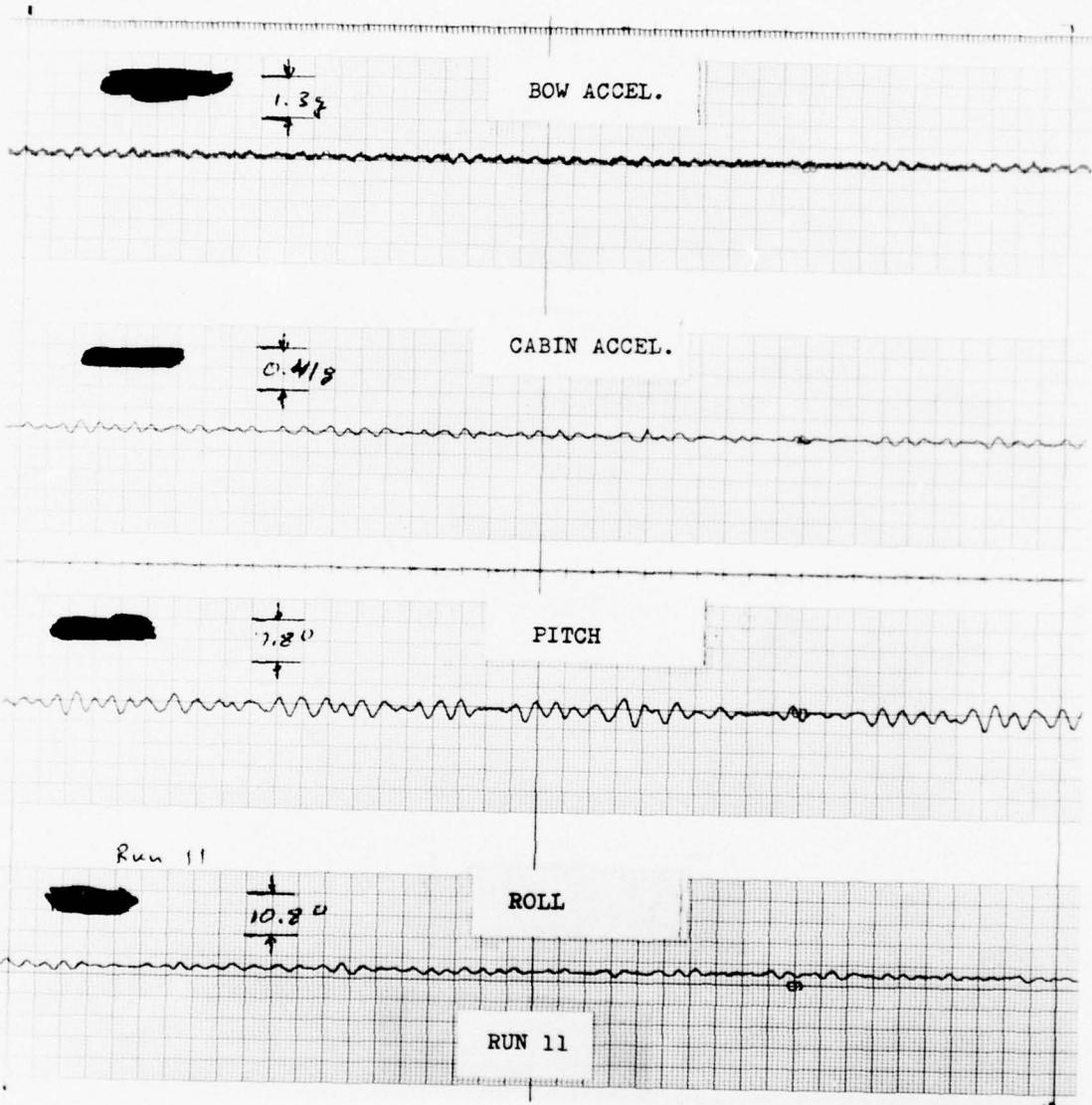
NOTES:

1. Craft station keeping next to WARRIOR.
2. Cargo was on craft only during last 4.8 minutes of run.
3. High noise levels and low signal levels invalidated all standard computations from the Bow acceleration data.
4. VOYAGEUR was sheltered from wave action by WARRIOR.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 11

| DERIVED<br>FROM:  | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH. ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|---|---------------------|-----------------------|-------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                                     | 2.67                | 2.05                  | 3.83                    | 0.096               | —                 |
| TIME HISTORY<br>PSHAFT PROGRAM                                      | 2.49                | 4.05                  | 0.097                   | —                   | —                 |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM                  | 2.02                | 3.65                  | 0.092                   | —                   | —                 |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION<br>PSHAFT PROGRAM | 2.01                | 3.74                  | 0.095                   | 0.136               | —                 |
| EXTREME<br>DOUBLE<br>AMPLITUDE                                      | 2.87                | 6.05                  | 0.145                   | —                   | —                 |



OPERATIONAL CONDITIONS

RUN # 12

CONDITION: Mooring on Lee side of WARRIOR, Off cushion

DATE: 11 OCTOBER 1972 TIME: 1054 EDT

CARGO: Two each 4700 pound containers

RUN DURATION: 8.95 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 45

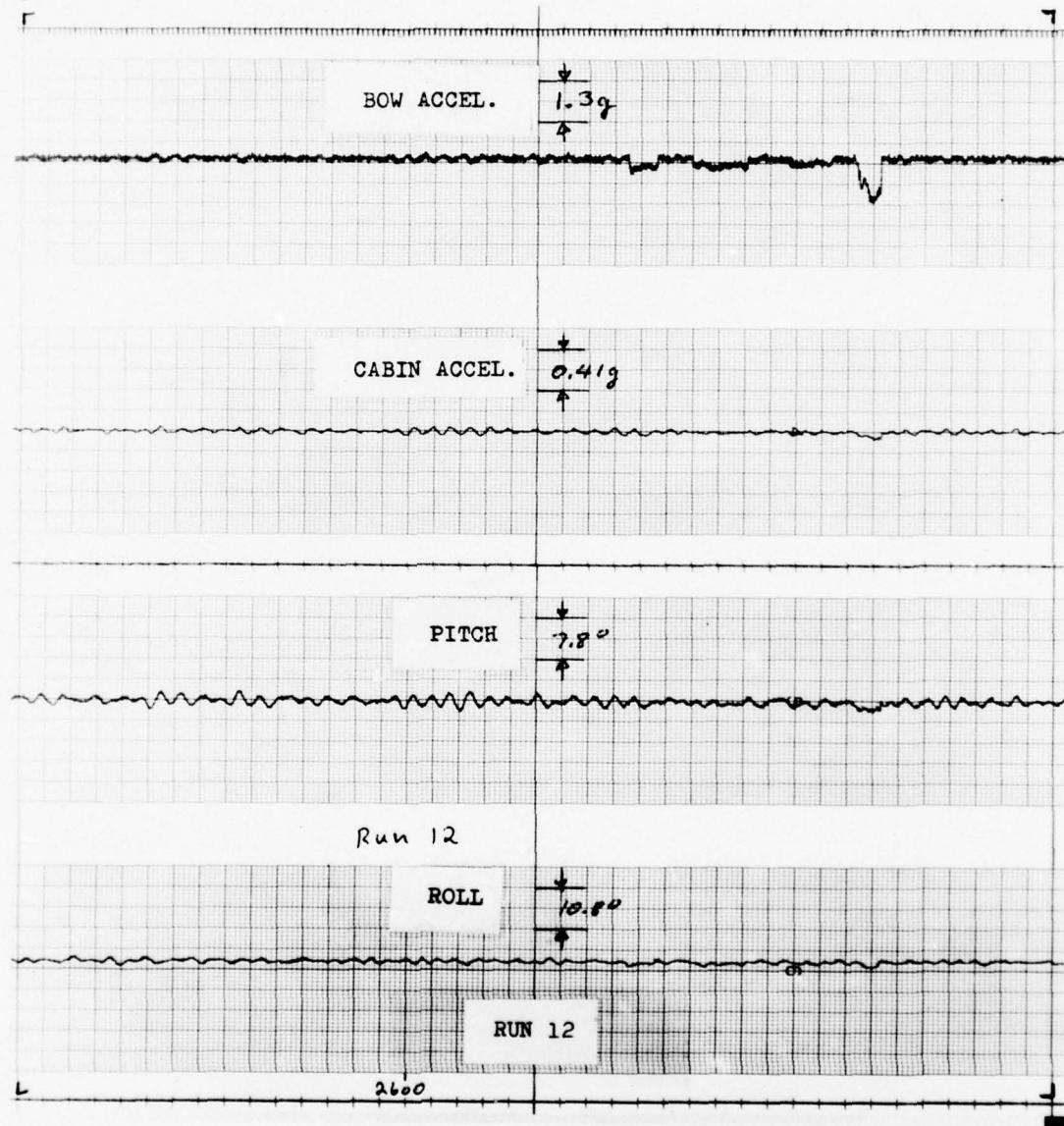
NOTES:

1. Craft station keeping next to WARRIOR.
2. Retrograde of cargo attempted.
3. High noise levels and low signal levels compounded with an electrical disturbance which offset the data has invalidated all computations from the Bow acceleration data.
4. Low signal levels near the ambient noise level invalidated all standard computations from the roll data.
5. VOYAGEUR was sheltered from wave action by WARRIOR.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN #12

| DERIVED<br>FROM:                                  | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH. ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|---|---------------------|-----------------------|-------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                   | 2.51                | —                     | 2.29                    | 0.067               | —                 |
| TIME HISTORY<br>PSHAFT PROGRAM                    |                     | —                     | 2.45                    | 0.072               | —                 |
| DOUBLE AMPLITUDE<br>DISTRIBUTION                  |                     | —                     | 2.16                    | 0.065               | —                 |
| PSHAFT PROGRAM                                    |                     |                       |                         |                     |                   |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>ACTION | 1.37                | 2.3                   | 0.068                   | —                   |                   |
| EXTREME<br>DOUBLE<br>AMPLITUDE                    | —                   | 3.42                  | 0.105                   | —                   |                   |



OPERATIONAL CONDITIONS

RUN # 13

CONDITION: Mooring on Lee side of WARRIOR, Off cushion

DATE: 11 OCTOBER 1972 TIME: 1201 EDT

CARGO: Two each 4700 pound containers

RUN DURATION: 8.53 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 43

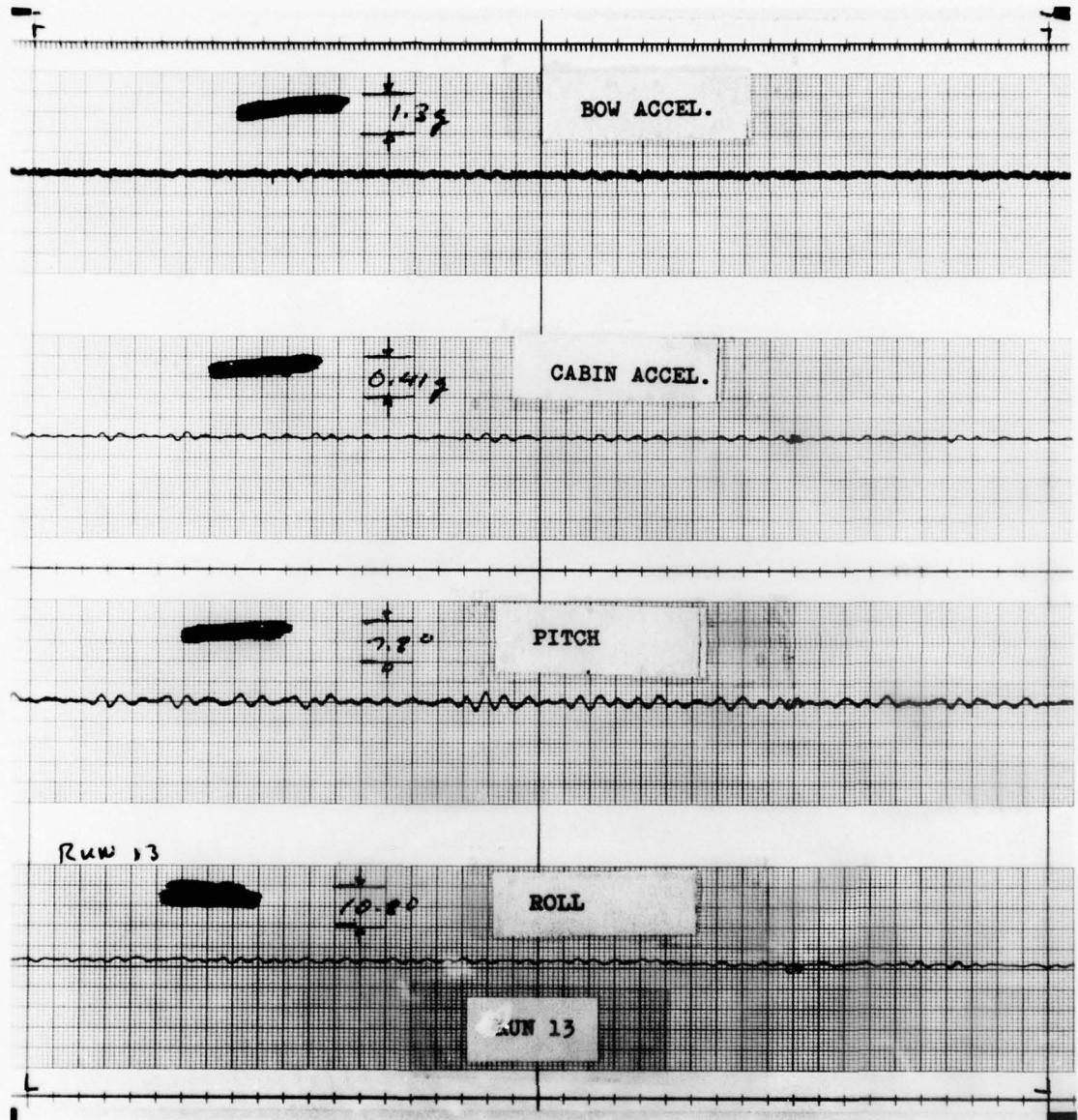
NOTES:

1. Craft station keeping next to WARRIOR.
2. High noise levels and low signal levels invalidated all standard computations from the Bow acceleration data.
3. Note 4 in Run 12 applies for the roll data.
4. VOYAGEUR was sheltered from wave action by WARRIOR.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 13

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 2.1                 | —                     | 2.15                   | 0.059               | —                 |
| TIME HISTORY<br>PSHAFT PROGRAM                     | —                   | —                     | 2.18                   | 0.059               | —                 |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM | —                   | —                     | 1.96                   | 0.057               | —                 |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION  | 1.84                | 2.1                   | —                      | 0.058               | 0.121             |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | —                   | 4.16                  | —                      | 0.109               | —                 |



OPERATIONAL CONDITIONS

RUN # 18

CONDITION: Mooring in Lee of LST, Off cushion

DATE: 13 OCTOBER 1972 TIME: 0800 EDT

CARGO: No containers

RUN DURATION: 7.88 MINUTES

POWER SPECTRA, DEGREES OF FREEDOM: 39

NOTES:

1. Broad low frequency components present in roll and pitch data. This condition invalidated the power spectra computations made from the roll data.
2. High noise levels and low signal levels invalidated all standard computations from the Bow acceleration data.
3. VOYAGEUR was sheltered from wave action by the LST.

SUMMARY OF SIGNIFICANT MOTIONS AND EXTREME DOUBLE AMPLITUDES

RUN # 13

| DERIVED<br>FROM:                                   | WAVE HEIGHT<br>FEET | ROLL ANGLE<br>DEGREES | PITCH. ANGLE<br>DEGREES | CABIN ACCEL.<br>G'S | BOW ACCEL.<br>G'S |
|--|---------------------|-----------------------|-------------------------|---------------------|-------------------|
| POWER SPECTRA<br>PSHAFT PROGRAM                    | 3.3                 | —                     | 2.44                    | 0.072               | —                 |
| TIME HISTORY<br>PSHAFT PROGRAM                     |                     | 3.42                  | 2.89                    | 0.073               | —                 |
| DOUBLE AMPLITUDE<br>DISTRIBUTION<br>PSHAFT PROGRAM | 2.07                | 2.3                   | 0.067                   | —                   |                   |
| INTERPRETED<br>VALUE FOR<br>SIGNIFICANT<br>MOTION  | 2.75                | 2.54                  |                         | 0.071               | 0.152             |
| EXTREME<br>DOUBLE<br>AMPLITUDE                     | 4.53                | 3.3                   | 0.099                   | —                   |                   |

$\times 50$

BOW ACCEL.

$\frac{1}{4}$   
3.2g  
 $\frac{1}{4}$

CABIN ACCEL.

$\frac{1}{4}$   
0.41g  
 $\frac{1}{4}$

PITCH

$\frac{1}{4}$   
7.8°  
 $\frac{1}{4}$

Run 18

ROLL

$\frac{1}{4}$   
10.8°  
 $\frac{1}{4}$

RUN 18

SURF CROSSING RUNS

RUNS S-1 to S-20

SURF DATA

RUN: S-1

CONDITION: Shore to Surf at Beach near Home base

CARGO: Two each 10420 pound containers

DATE: 8 OCTOBER 1972

TIME: 1050 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.2 DEG.

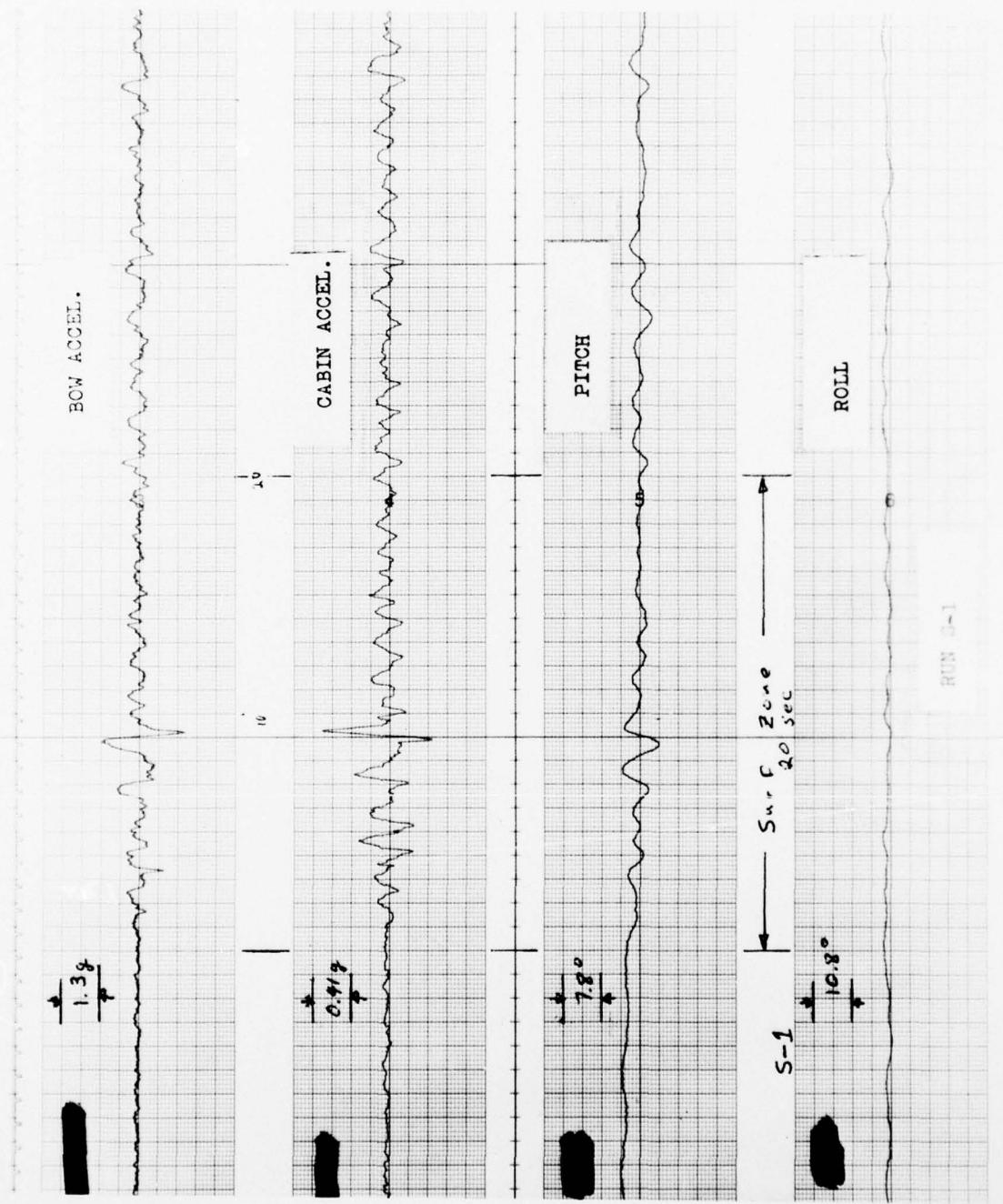
CABIN ACCEL.: 0.882G's

PITCH ANGLE: 7 DEG.

BOW ACCEL.: 2.86 G's

NOTES:

1. Estimated 2 ft. Surf Height (visual estimate).



SURF DATA

RUN: S-2

CONDITION: Surf to Shore at Beach near crane

CARGO: Two each 10420 pound containers

DATE: 8 OCTOBER 1972

TIME: 1100 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 6.5 DEG.

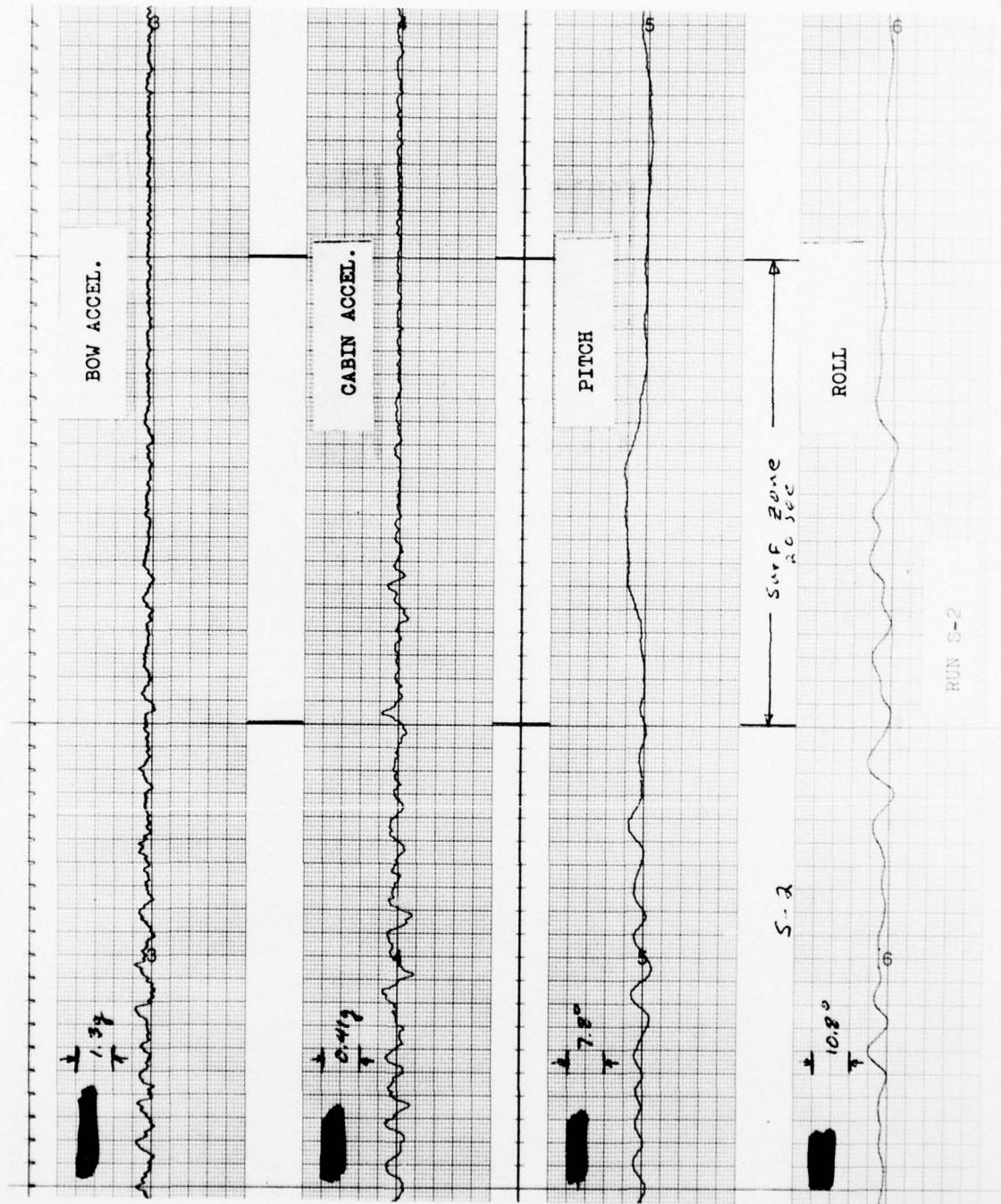
CABIN ACCEL.: 0.205 G's

PITCH ANGLE: 3.9 DEG.

BOW ACCEL.: 0.39 G's

NOTES:

1. Craft took 45° angle into surf.



SURF DATA

RUN: S-3

CONDITION: Shore to Surf at Beach near Crane

CARGO: Two each 10420 pound containers

DATE: 8 OCTOBER 1972

TIME: 1249 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 4.3 DEG.

CABIN ACCEL.: 0.308G's

PITCH ANGLE: 5.1 DEG.

BOW ACCEL.: 0.39 G's

NOTES:

1. Estimated 2 ft. Surf Height (visual estimate).
2. Craft took 45° angle into surf.



SURF DATA

RUN: S-4

CONDITION: Shore to Surf at Beach near Home base.

CARGO: Two each 4700 pound containers

DATE: 9 OCTOBER 1972 TIME: 1145 EDT

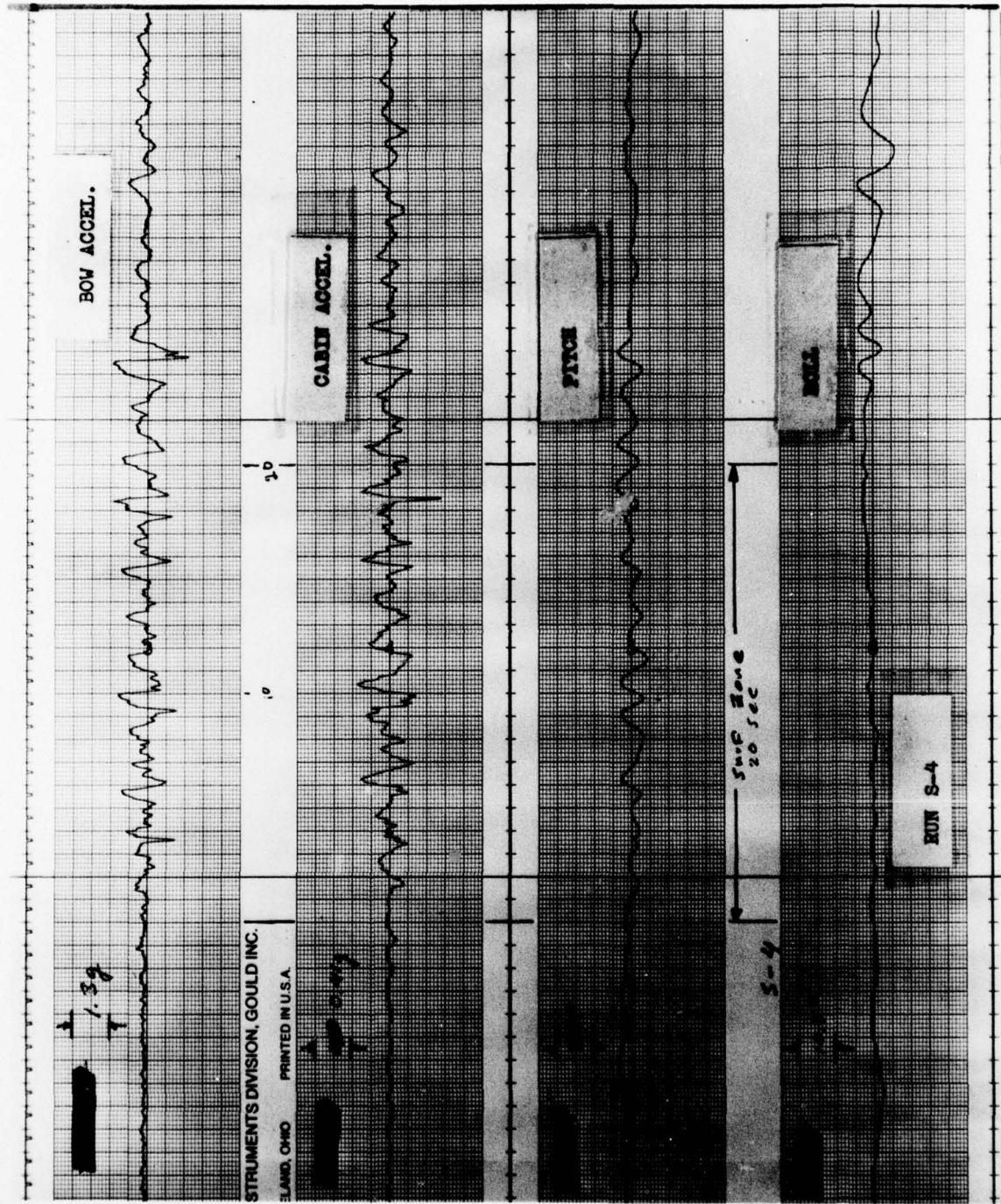
EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.7 DEG. CABIN ACCEL.: 0.697G's

PITCH ANGLE: 5.5 DEG. BOW ACCEL.: 1.95 G's

NOTES:

1. Estimated 3 to 4 ft. Surf Height (visual estimate)



SURF DATA

RUN: S-5

CONDITION: Shore to Surf at Beach near Crane

CARGO: No containers

DATE: 9 OCTOBER 1972

TIME: 1518 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 3.8 DEG.

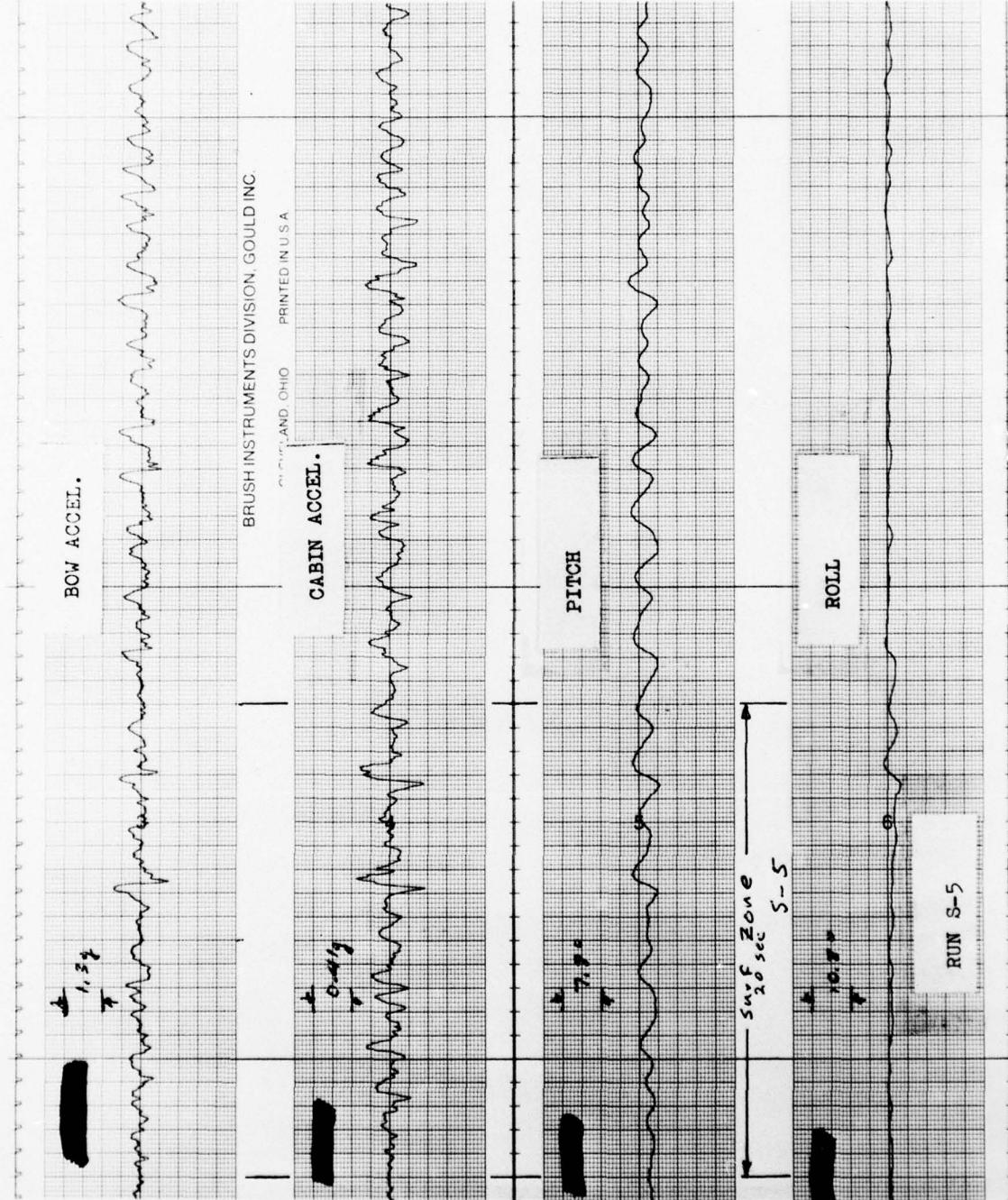
CABIN ACCEL.: 0.738 G's

PITCH ANGLE: 4.3 DEG.

BOW ACCEL.: 1.88 G's

NOTES:

1. Estimated 1 to 2 ft. Surf Height (visual estimate).
2. Craft took 45° angle into surf.



SURF DATA

RUN: S-6

CONDITION: Surf to Shore at Beach near Crane

CARGO: One each 10420 pound container

DATE: 9 OCTOBER 1972

TIME: 1601 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 6.5 DEG.

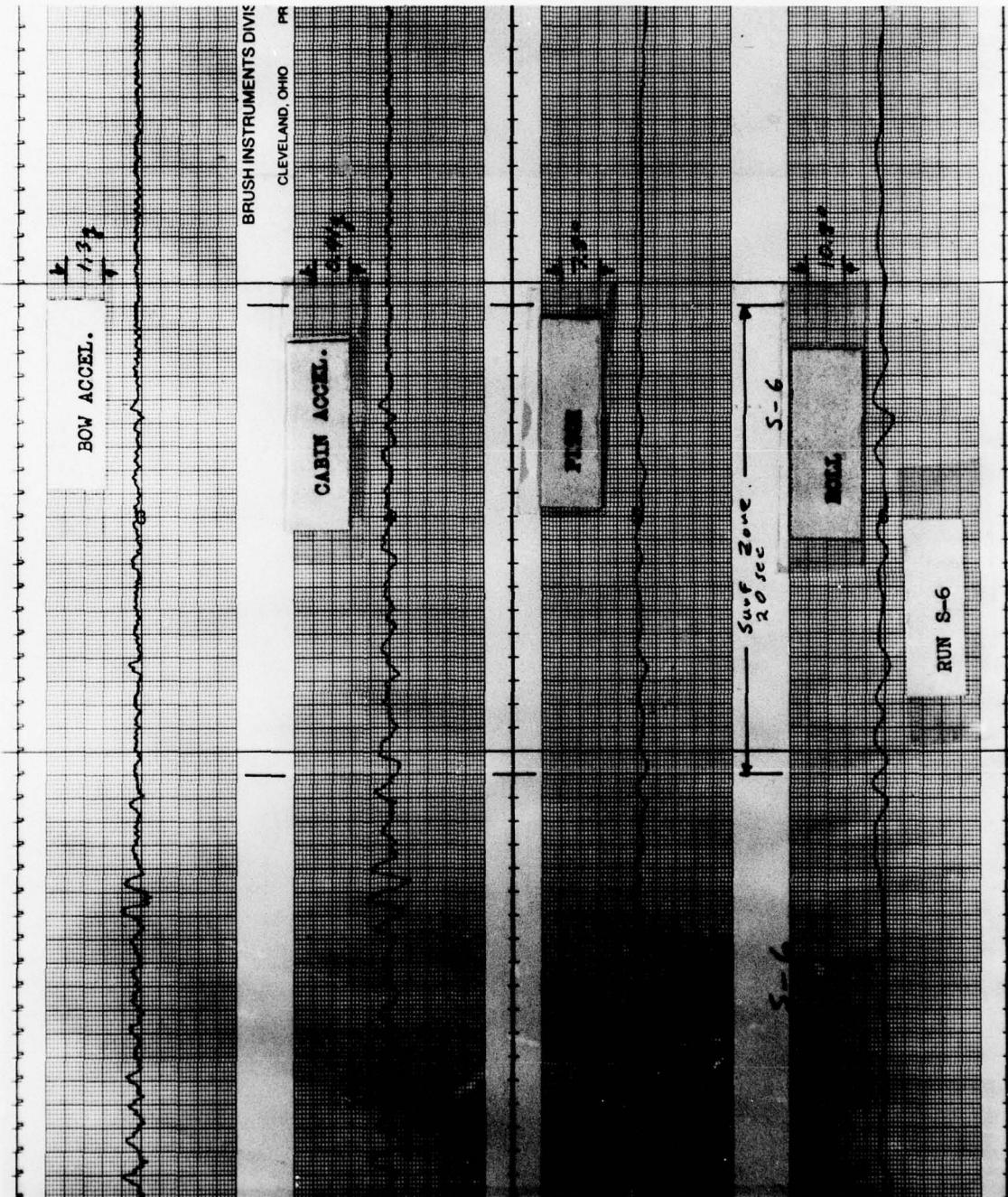
CABIN ACCEL.: 0.246G's

PITCH ANGLE: 1.6 DEG.

BOW ACCEL.: 0.39 G's

NOTES:

1. Estimated 3 ft. Surf Height (visual estimate).



SURF DATA

RUN: S-7

CONDITION: Shore to Surf at Beach near Crane

CARGO: No containers

DATE: 9 OCTOBER 1972

TIME: 1610 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.2 DEG.

CABIN ACCEL.: 0.205 G's

PITCH ANGLE: 2.3 DEG.

BOW ACCEL.: 0.39 G's

NOTES:

AD-A045 306

DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/G 13/10  
COMPILATION OF MOTION DATA OBTAINED ON VOYAGEUR ACV DURING OSDO--ETC(U)  
FEB 73 R D PIERCE

UNCLASSIFIED

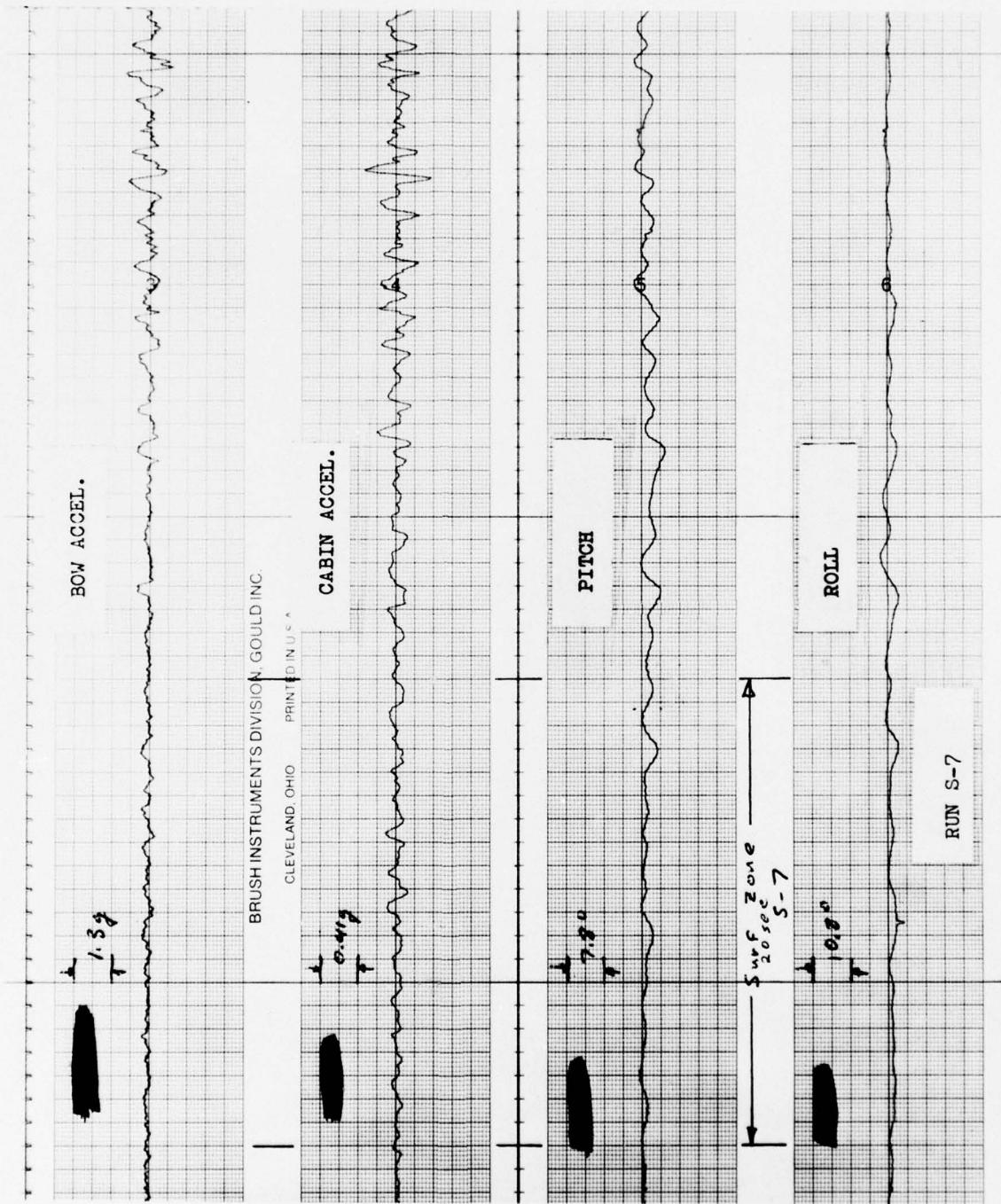
CID-29-1

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2 OF 2  
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045306

11-77

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DATE  
FILED  
11-77  
DDC



SURF DATA

RUN: S-8

CONDITION: Shore to Surf at Beach near Crane

CARGO: No containers

DATE: 11 OCTOBER 1972

TIME: 0936 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 3.2 DEG.

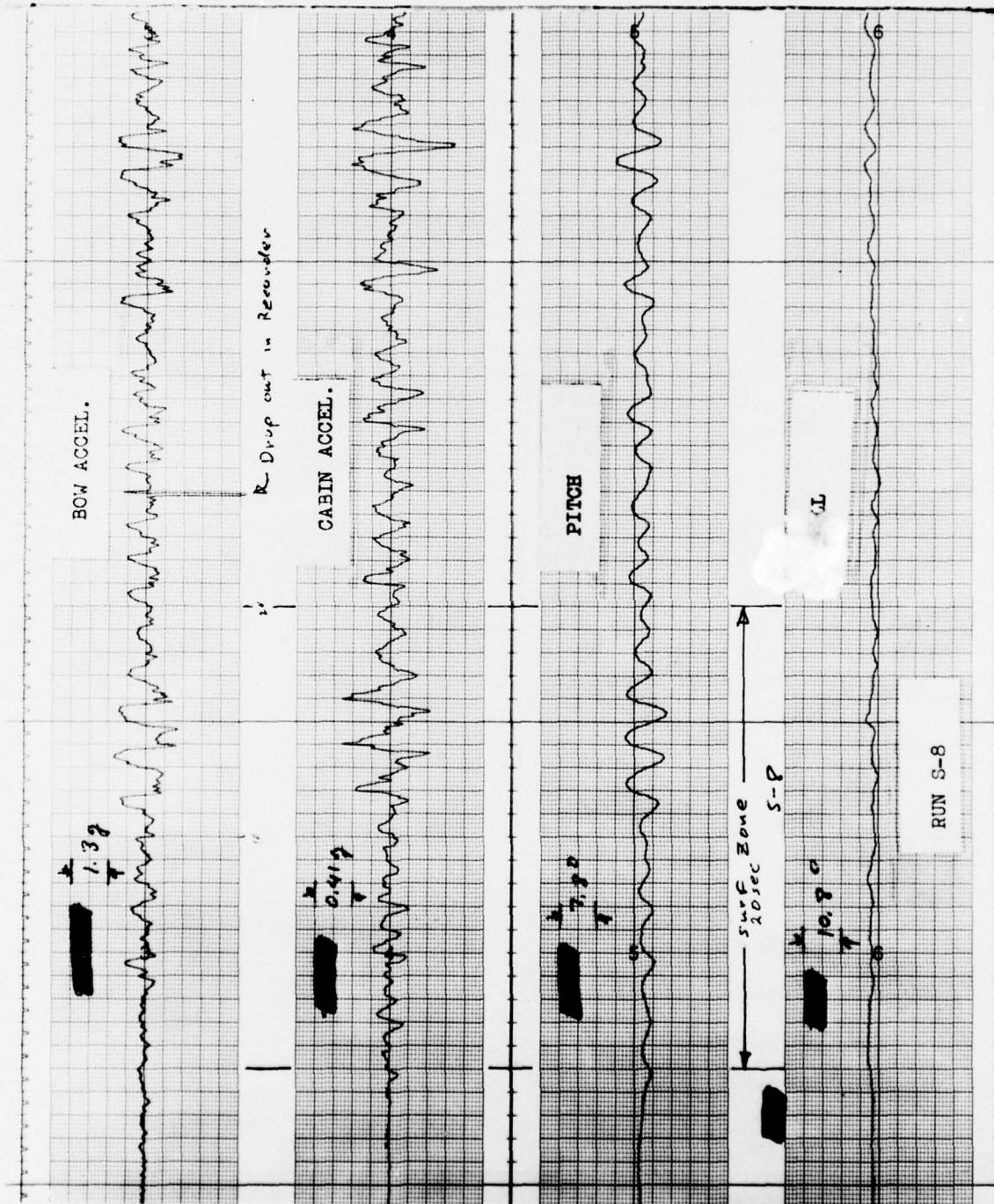
CABIN ACCEL.: 0.984 G's

PITCH ANGLE: 8.2 DEG.

BOW ACCEL.: 2.21 G's

NOTES:

1. Estimated 2 to 3 ft. Surf Height (visual estimate).



SURF DATA

RUN: S-9

CONDITION: Surf to Shore at Beach near Crane

CARGO: No containers

DATE: 11 OCTOBER 1972

TIME: 0956 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

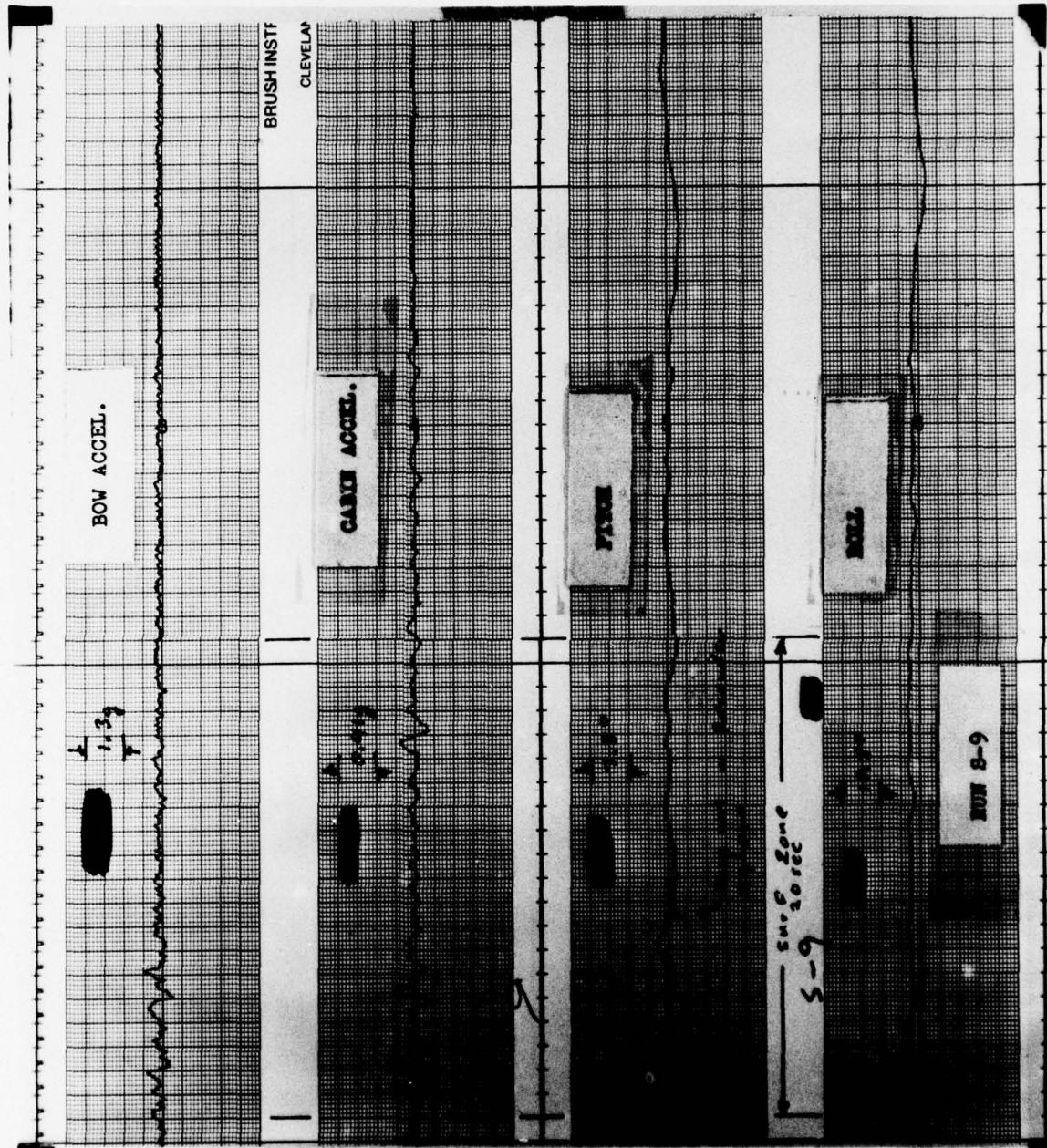
ROLL ANGLE: 2.2 DEG.

CABIN ACCEL.: 0.45 G's

PITCH ANGLE: 5.8 DEG.

BOW ACCEL.: 0.78 G's

NOTES:



SURF DATA

RUN: S-10

CONDITION: Shore to Surf at Beach near Crane

CARGO: No containers

DATE: 11 OCTOBER 1972

TIME: 1005 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.2 DEG.

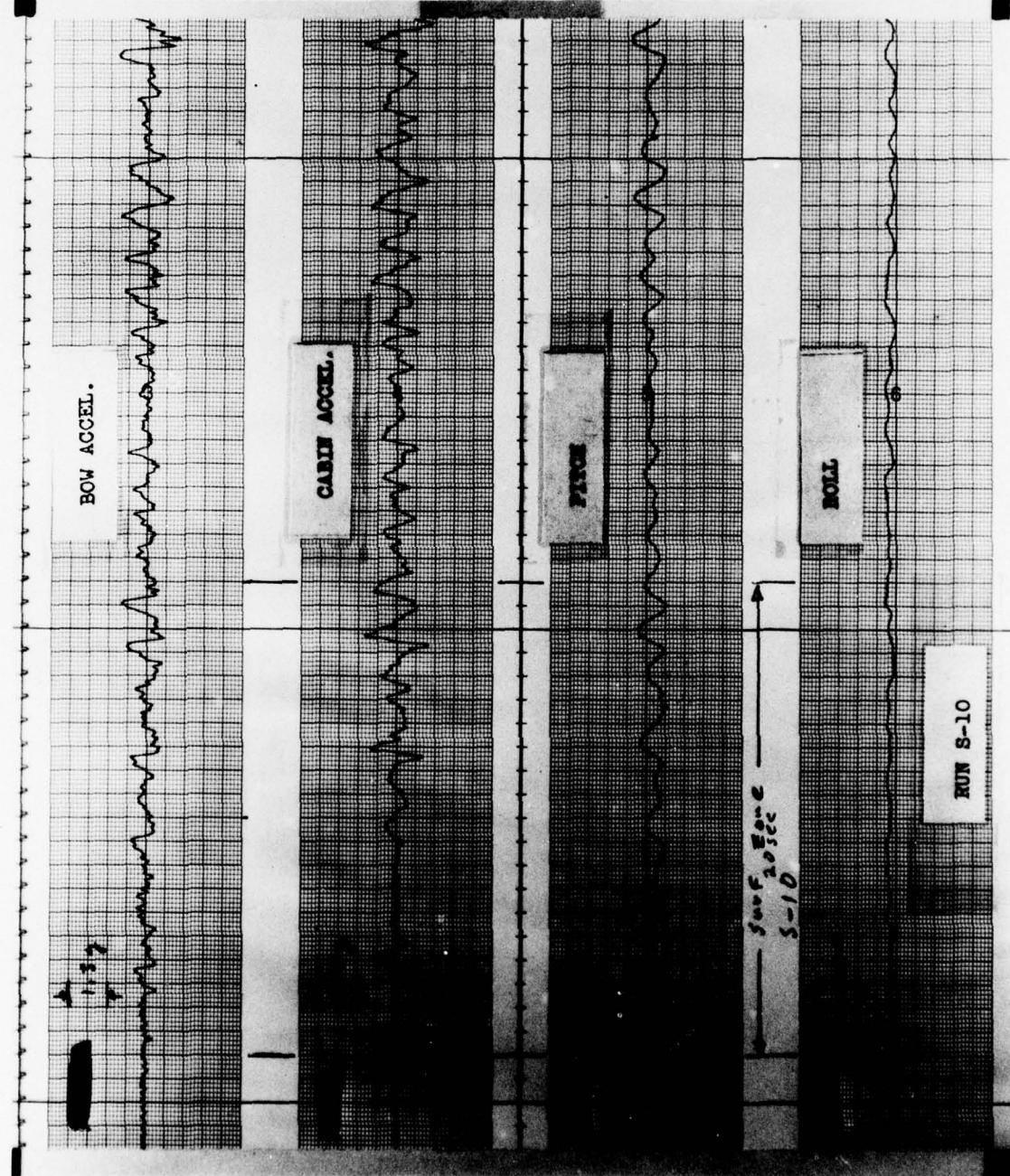
CABIN ACCEL.: 0.677G's

PITCH ANGLE: 5.8 DEG.

BOW ACCEL.: 1.23 G's

NOTES:

1. Craft at 45° angle into surf.



SURF DATA

RUN: S-11

CONDITION: Surf to Shore at Beach near Crane

CARGO: Two each 4700 pound containers

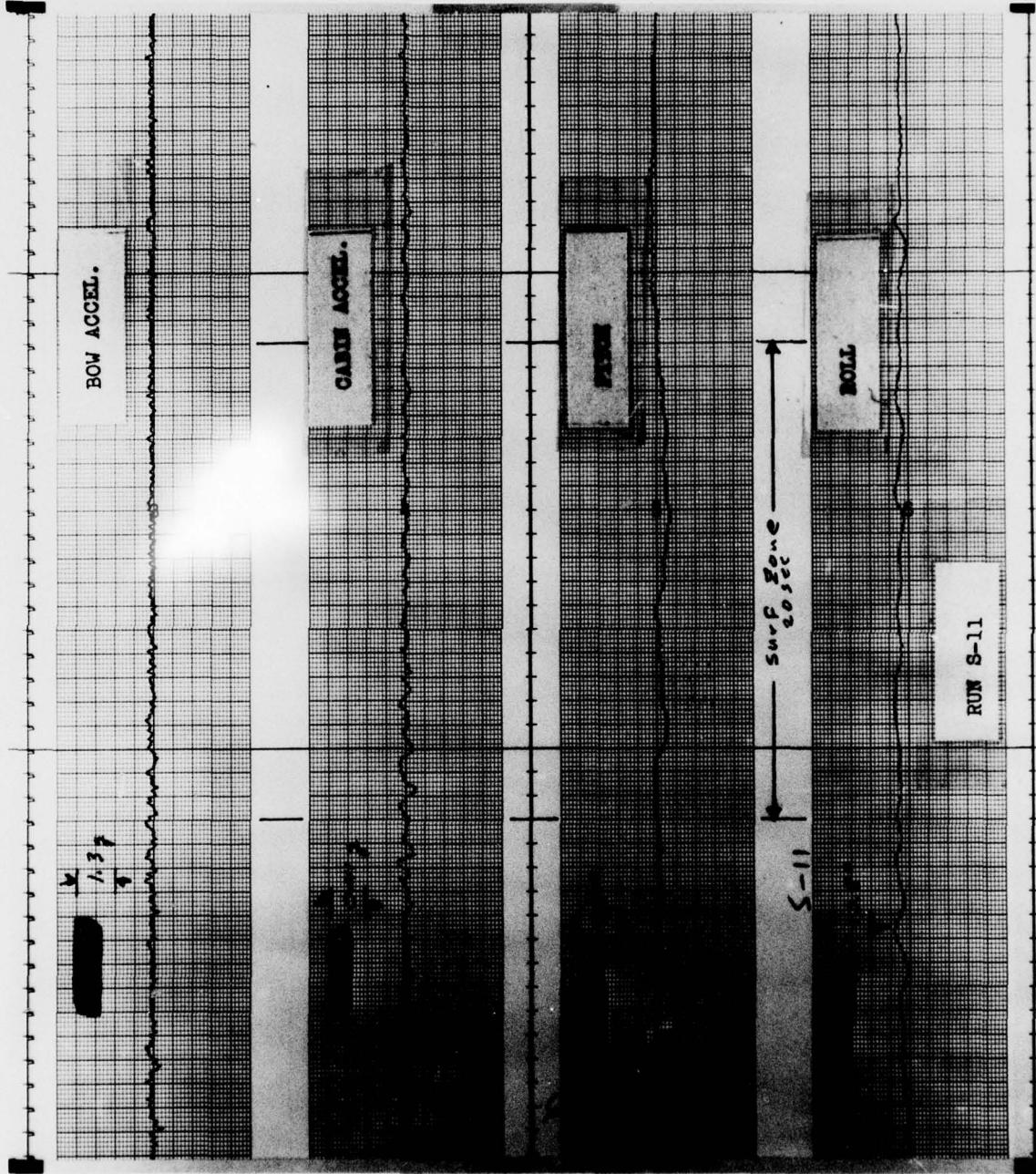
DATE: 11 OCTOBER 1972 TIME: 1028 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.2 DEG. CABIN ACCEL.: 0.164G's

PITCH ANGLE: 3.1 DEG. BOW ACCEL.: 0.13 G's

NOTES:



SURF DATA

RUN: S-12

CONDITION: Shore to Surf at Beach near Crane

CARGO: Two each 4700 pound containers

DATE: 11 OCTOBER 1972

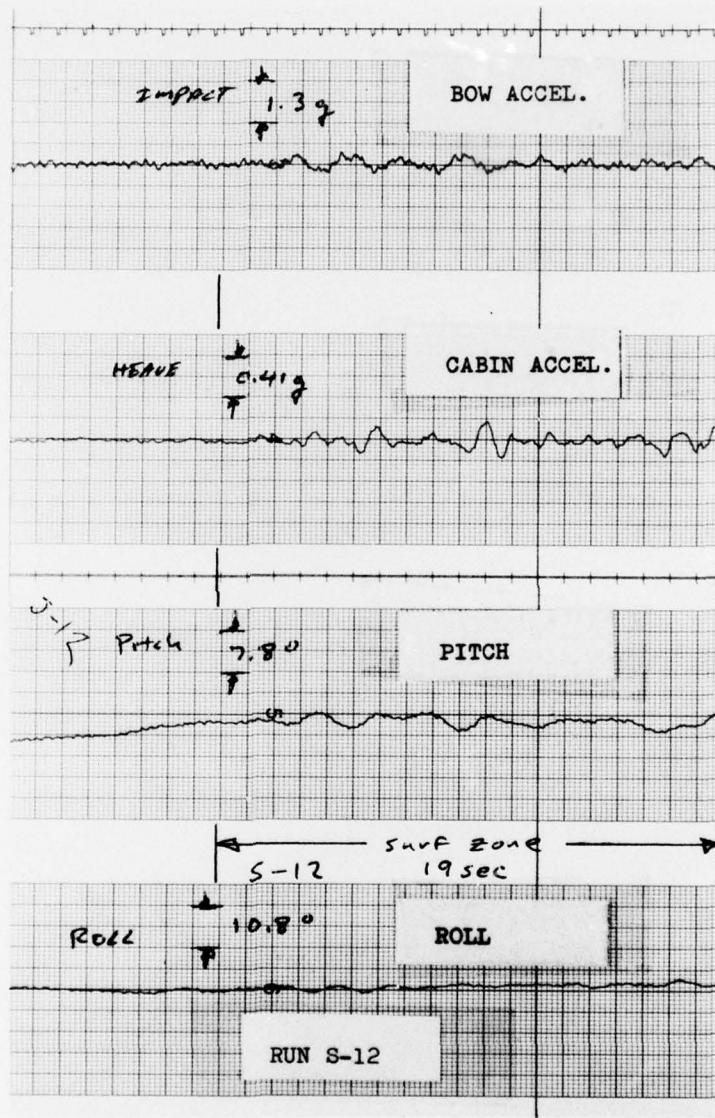
TIME: 1047 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.2 DEG. CABIN ACCEL.: 0.328G's

PITCH ANGLE: 3.5 DEG. BOW ACCEL.: 0.52 G's

NOTES:



SURF DATA

RUN: S-13

CONDITION: Shore to Surf at Beach near Crane

CARGO: Two each 4700 pound containers

DATE: 11 OCTOBER 1972

TIME: 1157 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 3.2 DEG.

CABIN ACCEL.: 0.985 G's

PITCH ANGLE: 7.8 DEG.

BOW ACCEL.: 2.48 G's

NOTES:

**1.3 g**

BOW ACCEL.

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**CABIN ACCEL.**

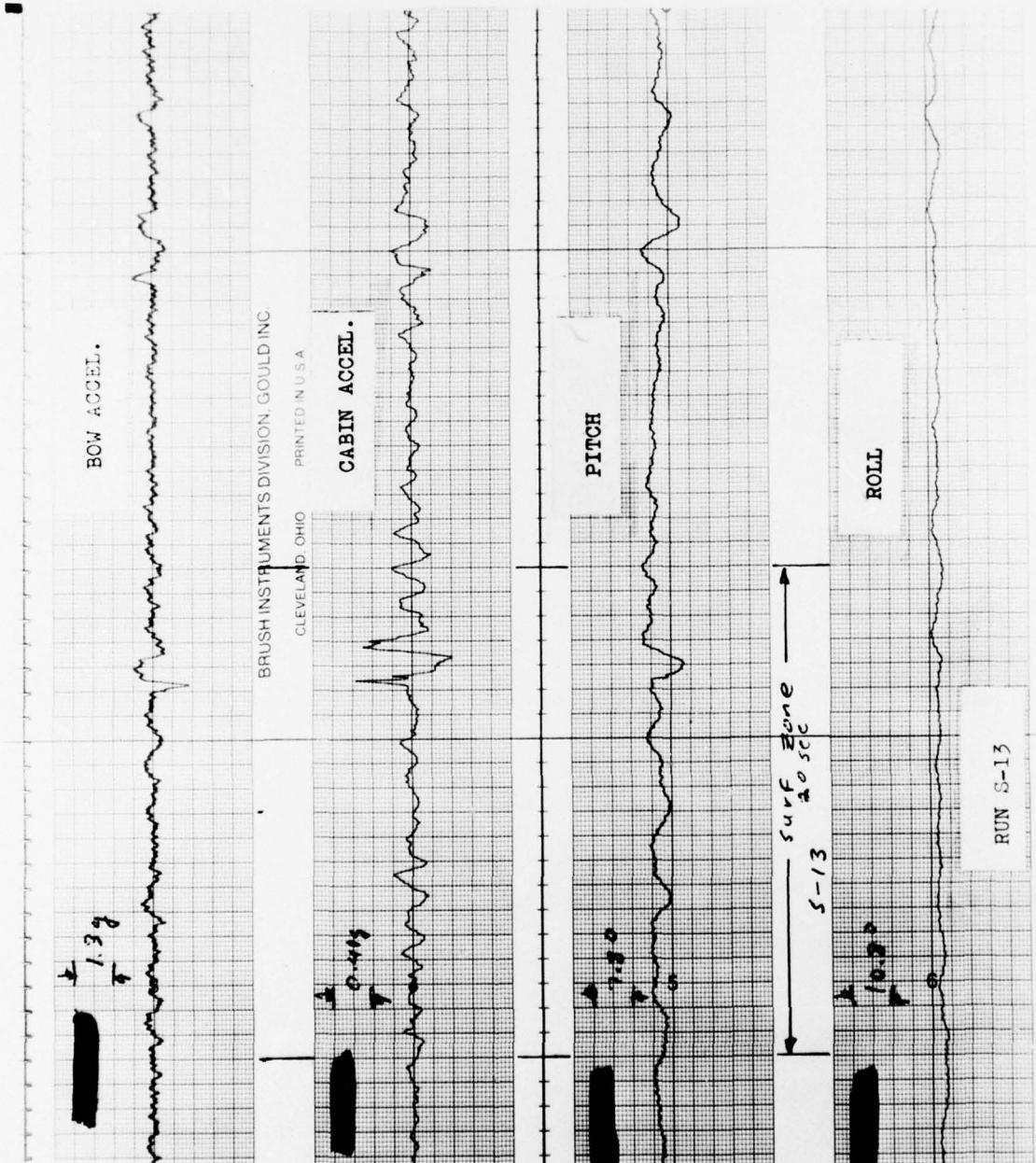
**0.44g**

PITCH

**5-13** **surf zone** **20 sec**

ROLL

RUN S-13



SURF DATA

RUN: S-14

CONDITION: Surf to Shore at Beach near Crane

CARGO: Two each 4700 pound containers

DATE: 11 OCTOBER 1972

TIME: 1220 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.7 DEG.

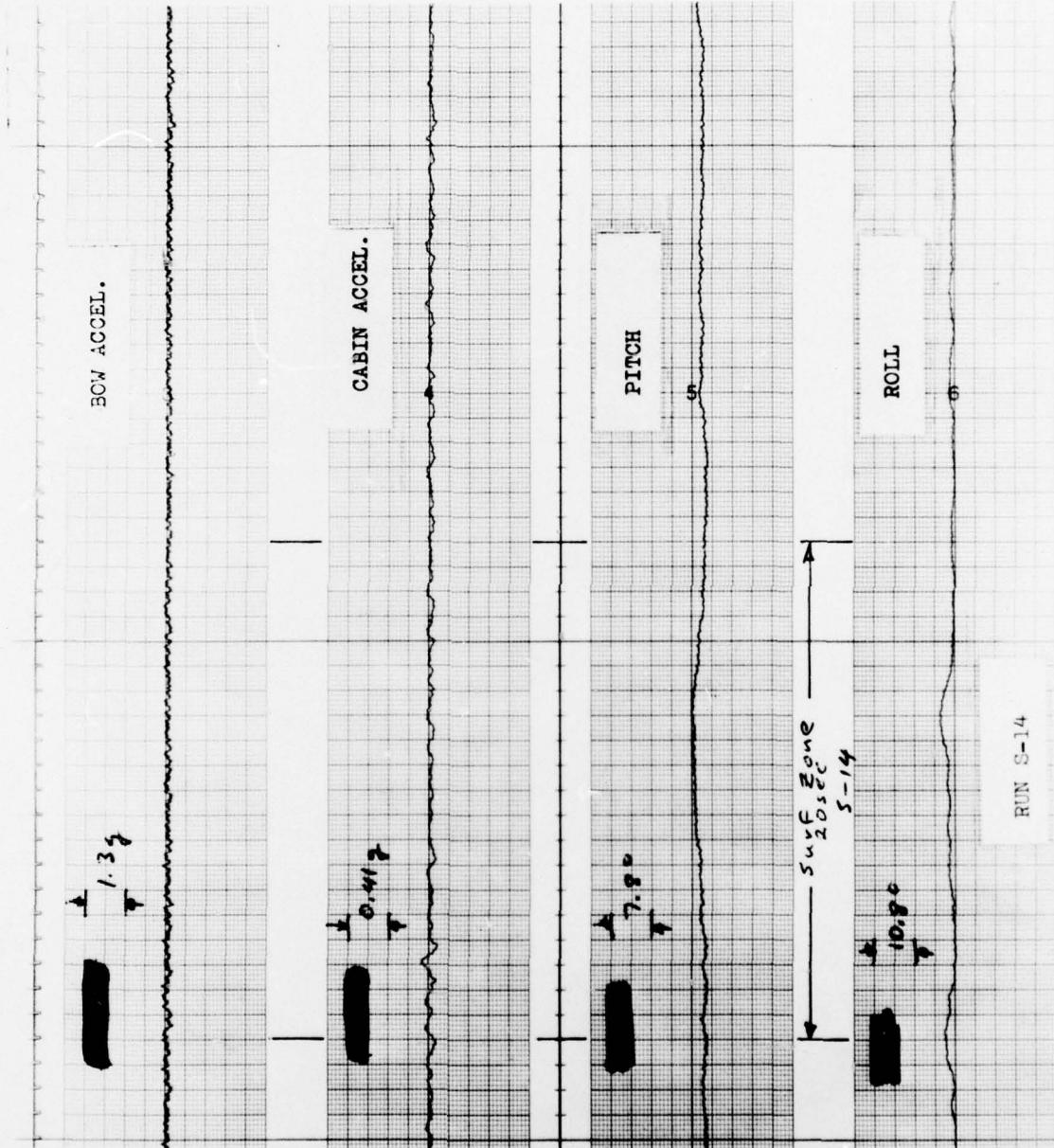
CABIN ACCEL.: 0.143G's

PITCH ANGLE: 2.7 DEG.

BOW ACCEL.: 0.13 G's

NOTES:

1. Estimated 1 to 2 ft Surf Height (visual estimate).



SURF DATA

RUN: S-15

CONDITION: Shore to Surf at Beach near Crane

CARGO: No containers

DATE: 11 OCTOBER 1972

TIME: 1427 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 1.1 DEG.

CABIN ACCEL.: 0.615G's

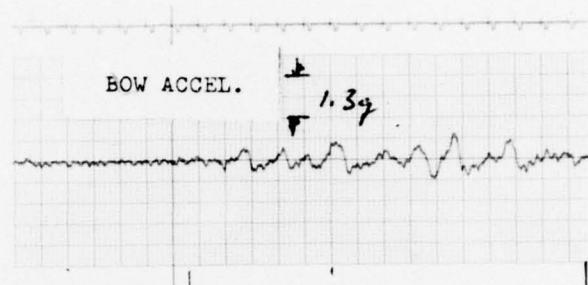
PITCH ANGLE: 4.3 DEG.

BOW ACCEL.: 1.36 G's

NOTES:

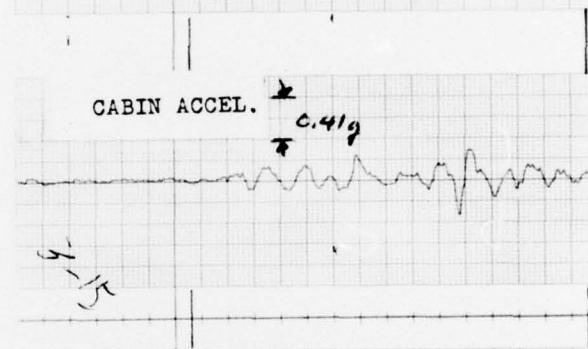
BOW ACCEL.

1.3g



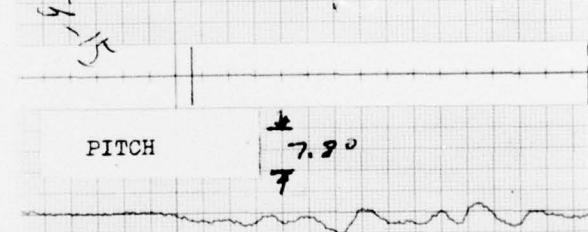
CABIN ACCEL.

0.41g



PITCH

7.8°

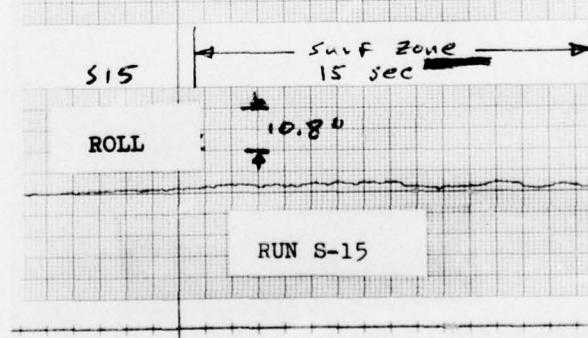


S15

SURF ZONE  
15 sec

ROLL

10.8°



RUN S-15

SURF DATA

RUN: S-16

CONDITION: Surf to Shore at Beach near Crane

CARGO: No containers

DATE: 11 OCTOBER 1972

TIME: 1437 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

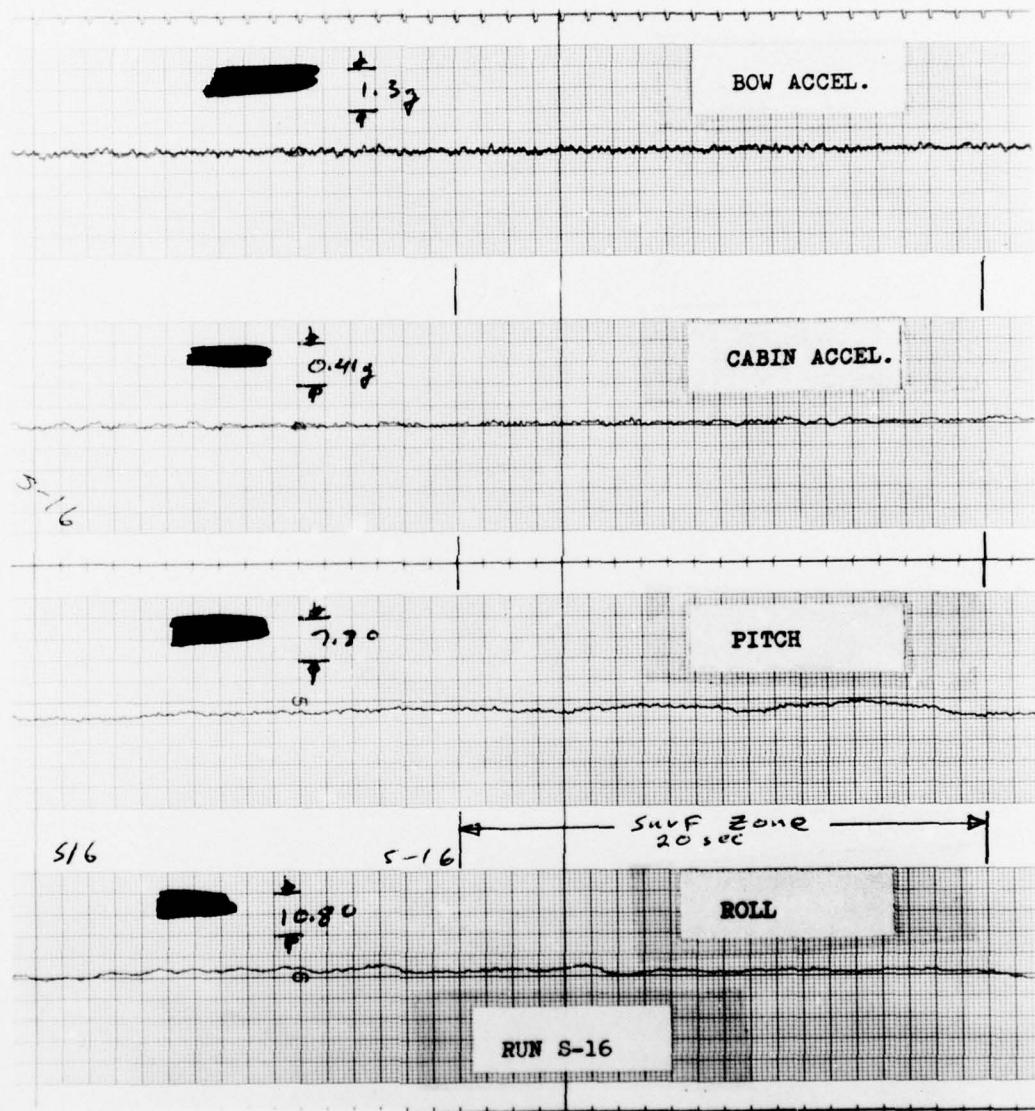
ROLL ANGLE: 2.2 DEG.

CABIN ACCEL.: 0.062G's

PITCH ANGLE: 3.1 DEG.

BOW ACCEL.: 0.13 G's

NOTES:



SURF DATA

RUN: S-17

CONDITION: Shore to Surf at Beach near Crane

CARGO: No containers

DATE: 11 OCTOBER 1972

TIME: 1455 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.2 DEG.

CABIN ACCEL.: 0.45 G's

PITCH ANGLE: 3.9 DEG.

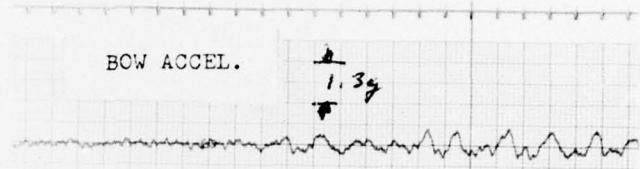
BOW ACCEL.: 0.91 G's

NOTES:

1. Craft took 45° angle into surf.

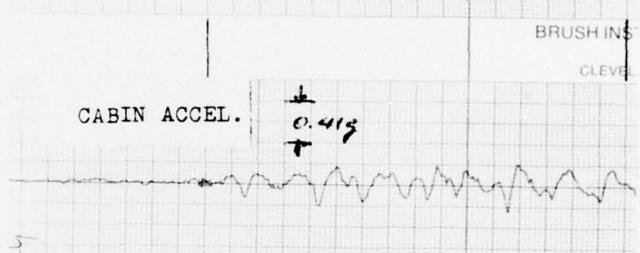
BOW ACCEL.

1.3g



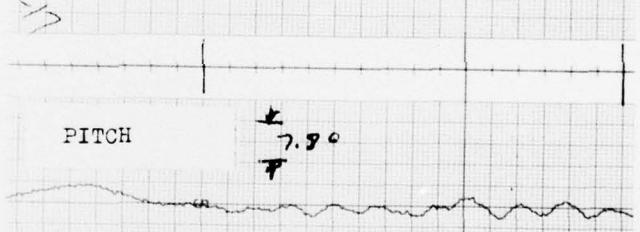
CABIN ACCEL.

0.41g



PITCH

7.9°

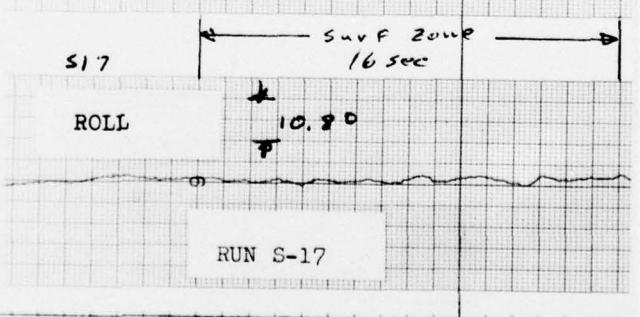


S17

SURF ZONE  
16 sec

ROLL

10.8°



RUN S-17

SURF DATA

RUN: S-18

CONDITION: Surf to Shore at Beach near Home base

CARGO: No containers

DATE: 11 OCTOBER 1972

TIME: 1537 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

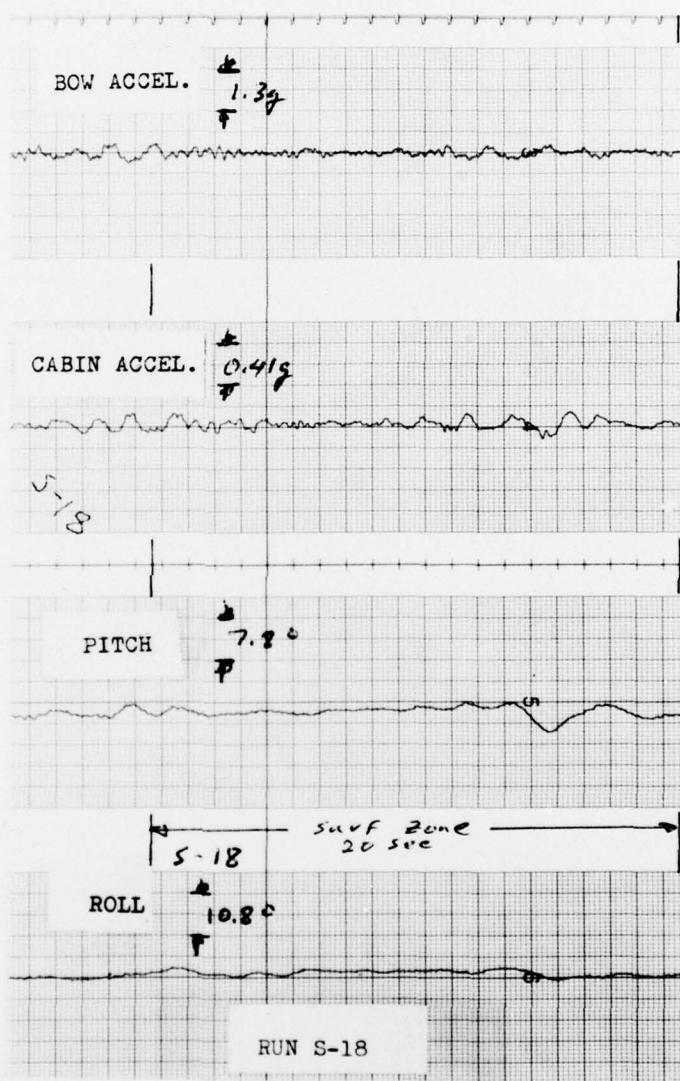
ROLL ANGLE: 2.7 DEG.

CABIN ACCEL.: 0.246 G's

PITCH ANGLE: 5.5 DEG.

BOW ACCEL.: 0.39 G's

NOTES:



SURF DATA

RUN: S-19

CONDITION: Shore to Surf at Beach near Home base

CARGO: No containers

DATE: 13 OCTOBER 1972

TIME: 0748 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 3.2 DEG.

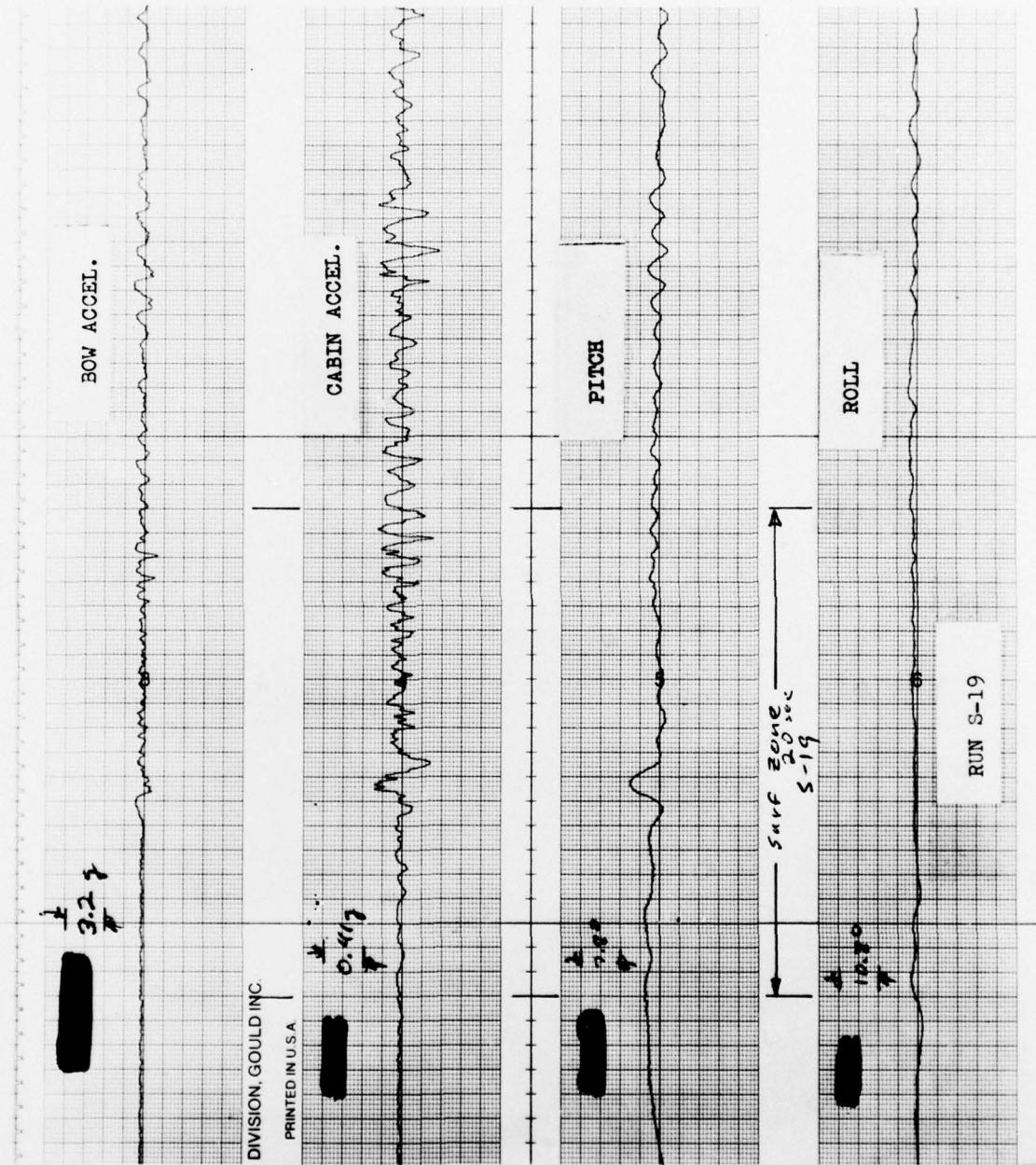
CABIN ACCEL.: 0.574G's

PITCH ANGLE: 7 DEG.

BOW ACCEL.: 1.6 G's

NOTES:

1. Estimated 2 to 3 ft. Surf (visual estimate).



SURF DATA

RUN: S-20

CONDITION: Shore to Surf at Beach near Crane

CARGO: No containers

DATE: 13 OCTOBER 1972

TIME: 0934 EDT

EXTREME DOUBLE AMPLITUDE FROM STRIP CHART RECORDS:

ROLL ANGLE: 2.2 DEG.

CABIN ACCEL.: 0.82 G's

PITCH ANGLE: 6.2 DEG.

BOW ACCEL.: 1.6 G's

NOTES:

1. Estimated 2 to 3 ft. Surf Height (visual estimate).

